

A good start in life

Yvonne Kelly

UCL Lunch Hour Lecture February 2014

Abstract The more advantages a child has early in life, the better their health and development and their own socioeconomic circumstances in adulthood. This transcript, based on a recent lecture, examines what factors during pregnancy and in the early years of life set children off on better life trajectories, and what can be done to ensure that every child has a good childhood.

Author/Speaker Yvonne Kelly is Professor of Lifecourse Epidemiology in the research UCL Department of Epidemiology & Public Health, and the Associate Director of the ESRC funded International Centre for Lifecourse Studies in Society & health (ICLS). Her research interests include the causes and consequences of socioeconomic inequalities in childhood health and development.



The International Centre for Lifecourse Studies in Society and Health (ICLS) is funded by the UK Economic and Social Research Council (ESRC) ES/J019119/1 (2013 – 2017). ICLS is a multidisciplinary research centre, directed by Professor Amanda Sacker, that supports research at UCL, University of Manchester, University of East London and Örebro University Hospital Sweden.
E: icls@ucl.ac.uk W: www.ucl.ac.uk/icls T: [@icls_info](https://twitter.com/icls_info)



A good start in life

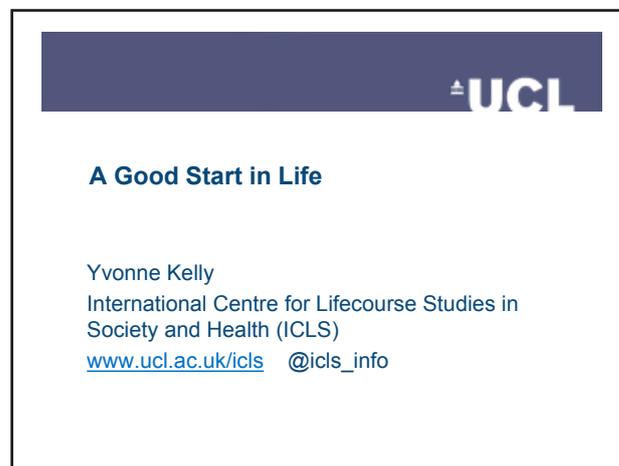
Yvonne Kelly, UCL Lunch Hour Lecture February 2014

SLIDE 1

If you do an internet search on the title of this lecture 'A Good Start in Life' you come up with a vast number of links. There's a lot of advice out there for expecting parents and parents with children from experts in the field, child development experts, childcare experts on various aspects of child rearing. There are also numerous links to intervention programmes, again aimed at improving the lot of young children and improving the chances of healthy development. Also you'll find links to major reports in this area, for example the recent Chief Medical Officer's, Sally Davies' report on early life (Chief Medical Officer's annual report 2012: Our Children Deserve Better: Prevention Pays), and Michael Marmot's review on determinants of health. Those reports have thrown a spotlight on the evidence from research highlighting the importance of child health and development.

Early child health and development is important contemporaneously. We are very interested in how well children are doing in the here and now. So how well children grow, their nutritional status, their social and emotional competencies, their speech and language abilities, their readiness to learn, all of these are important markers in how well children are doing.

But the early childhood and development and indeed the social conditions in which children grow up are incredibly important for health and wellbeing right throughout the life course. We often hear phrases like these years 'cast a long shadow' because what happens in early life has long term effects in terms of health throughout the life course. So today I'm going to try to give you a flavour of some of the research carried

A rectangular box containing the slide content. At the top right is the UCL logo. Below it is the title 'A Good Start in Life'. Underneath is the speaker's name 'Yvonne Kelly' and her affiliation 'International Centre for Lifecourse Studies in Society and Health (ICLS)'. At the bottom are the website 'www.ucl.ac.uk/icls' and the Twitter handle '@icls_info'.

out by ESRC funded the International Centre for Lifecourse Studies in Society and Health, which is based here in the UCL Department of Epidemiology and Public Health. And researchers in our group have been working in this area for around the last two decades.

So thinking about early child health and development a vast number of influences have a bearing on how well children develop. And we can think about those conceptually, we can arrange those into a sphere of influence. Very proximal spheres, for instance, might include the nutritional environment. So right from the very beginning, during foetal life, it's crucial that mothers are well nourished for good foetal growth to occur. And then in the first few months of life the type of milk a child receives has a bearing on a child's development. Then on the introduction of solids and in the early years the sorts of food children eat has a huge bearing on aspects of their development. Also other proximal influences might be the sort of activities that children do. Not just their physical activities, which of course help growth and healthy development, but also the activities that are occurring within the home and within care

taking settings between the child and the care giver. Those transactions between the child and care giver are enormously important in terms of that child's healthy development. When we're thinking about health and development we're

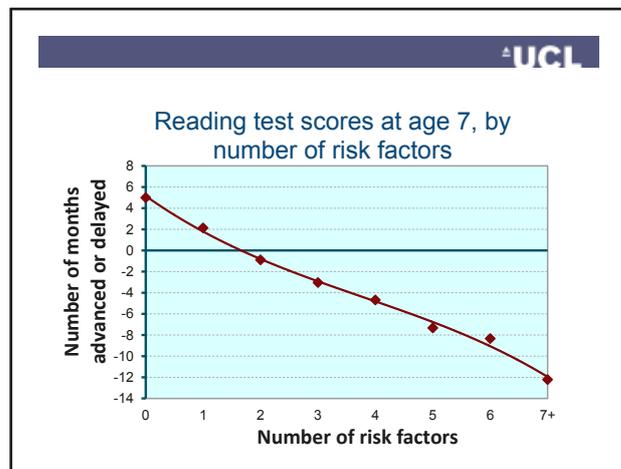
looking at three domains that overlap and interlink :-physical health, social and emotional wellbeing, and cognitive functioning. These things interlink and influence each other.

SLIDE 2

I mentioned about the sphere of influence and this first chart that I'm going to show you shows reading scores for children aged seven years. And from left to right on the X axis we counted up the number of risk factors, adversities that children were exposed to in the first few years of life. And these sorts of adversities were things like low birth weight, not being breastfed, growing up in poverty, growing up in damp, overcrowded conditions, having parents or carers with no educational qualifications, growing up in a poor residential area. All these things were markers of the environment, tapping into this idea of the spheres of influence.

These data were taken from a large UK survey, called the Millennium Cohort Study. And these are data on about 14,000 seven year olds. And I specifically mention the size of the study because in the type of research that we do – social epidemiology and lifecourse epidemiology – the number of participants and individuals that are included in the study gives us more confidence about the reliability of the results that we come up with.

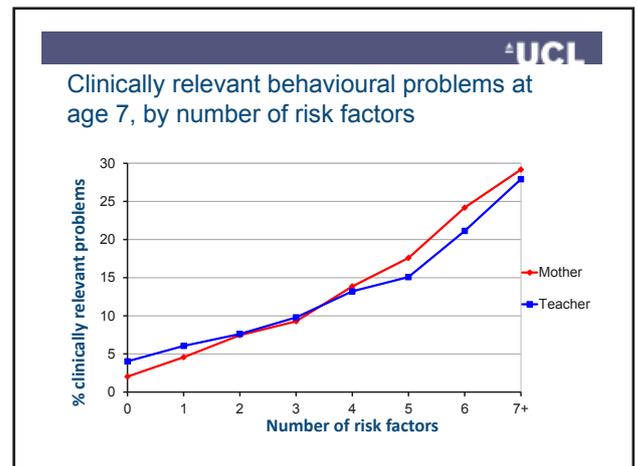
So sweeping from left to right on this slide you can see that as the number of adversities – the number of risk factors that children are exposed to – increases the reading scores drop. So children who are exposed to zero adversities on the left hand side there are on average five months ahead of the crowd. Working from left to right children exposed to five adversities on average seven months behind, and those exposed to seven or more adversities around twelve months or more behind the crowd. So you can see by age seven this yawning gap, an eighteen month gap between the worst off and



the best off in terms of their reading scores. I should point out also at this point that these are average effects. So children could be exposed to 3, 4, 5, 6 exposures but do better than the average. Conversely they could also do worse. So these are average effects.

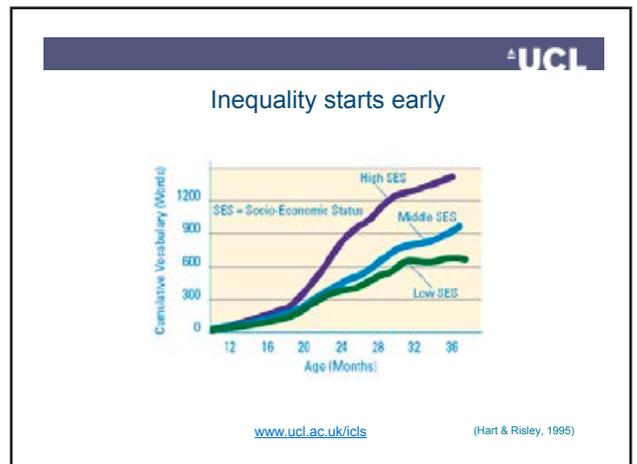
SLIDE 3

We see a similar picture in relation to exposure to risk and markers of early child development, regardless of the marker we look at. So the next chart shows the probability, the likelihood of having clinically relevant behavioural problems, again at age seven, again using this large population survey, the Millennium Cohort Study. And these difficulties, these behavioural problems would be things like hyperactivity, problems with conduct, problems with peers, emotional symptoms linked to depression. And as you can see, going from left to right you there is an eight to tenfold increase in the likelihood, the probability, the proportions of children with clinically relevant problems as rated by their parents and their teachers at age seven. And we see a similar picture if we plot, for example, the risk of obesity against a number of adversities.



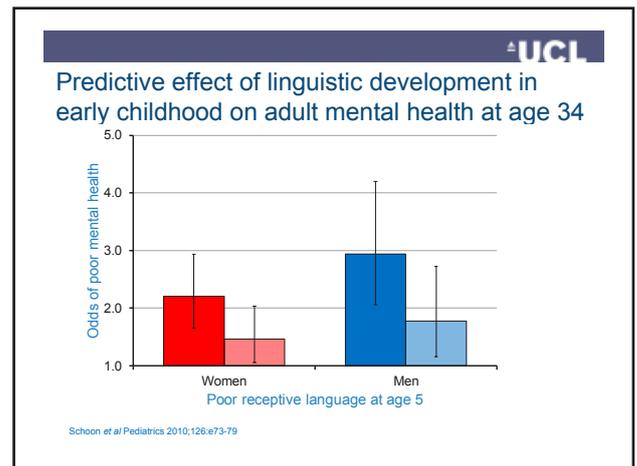
SLIDE 4

But these differences or these inequalities start very early in life and this next slide shows the development of linguistic ability in the first three years of life. This is not from our research group, this is from a famous paper by Hart & Risley almost twenty years ago. And it shows very strong divergent patterns, contingent on the social conditions in which a child is growing up in terms of the vocabulary development. And as you can see on the right hand side of the graph, already by three years of age there is this stark difference with children from the most advantaged groups having twice of the size of vocabulary as the ones from disadvantaged social circumstances.



SLIDE 5

So the social circumstances in which children live and grow up, and indeed in which we all live, have huge impacts on our health and for children on their development. The social circumstances in which we live combines with our biology in complex and dynamic ways to produce differences in the risk of health and risk of healthy development in young children. These are important as I mentioned before. These differences in early childhood have long lasting impacts and this next slide shows an example from Ingrid Schoon, based at the Institute of Education, where she looks at data from the 1970 Birth Cohort looking at the risk of later life outcomes, here's mental health in men and women. Children with poor linguistic abilities are about twice as likely to have poor psychological health on a range of measures in early adult

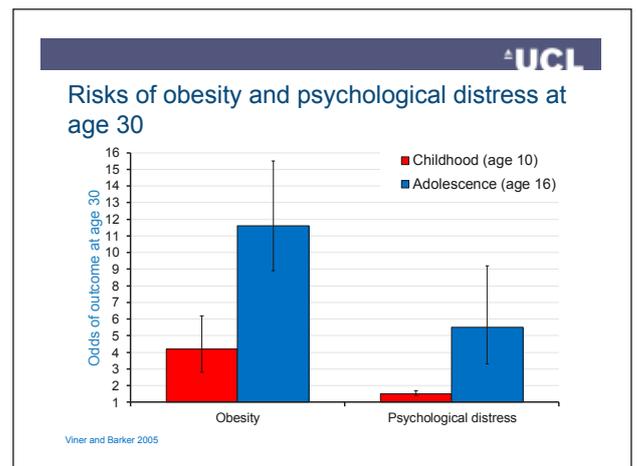


life around 34 years of age if they had limited linguistic abilities at age five. She goes on to show relationships into a whole range of other markers. Perhaps not surprisingly limited adult literacy also follows on from poor reading scores earlier in life too.

SLIDE 6

But it's not just reading and mental health and adult literacy, there are continuities in other markers of health and development. This slide taken from a paper by our UCL colleague Russell Viner on the left hand side again using data from the 1970 Birth Cohort Study shows the continuities in obesity. So for example, individuals who are obese in the 1970 cohort as children were four times more likely to be obese as young adults than those individuals who weren't obese as children, and on the right hand side you can see the relationship with psychological distress. So children with psychological and behavioural problems were more likely to go on to have significant psychological distress in the adult years.

I could show you countless more examples of aspects of how physical health tracks forward in terms of the risk of all sorts of different health outcomes, all sorts of different life chance outcomes and indeed the risk of premature death but we would need more time than we have during this lecture.

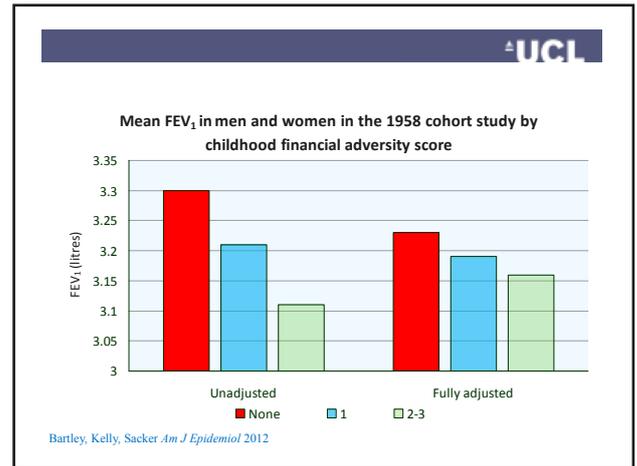


SLIDE 7

This next slide, from a paper by Mel Bartley, from our research group, shows the link between the social conditions in which children are growing up and a marker of adult health. Here she uses data from around 10,000 participants from the 1958 Birth Cohort Study and it simply plots the lung function measure and measure of lung function in mid life against the number of financial adversities experienced during early life. And as you can see for adults who had zero financial adversities in their early life, had an average lung function measure about 200 mls greater than those who experienced financial adversities early in life. Well, what does that mean? That translates into about a 7% difference in lung function which on a practical level would lead to a greater likelihood for example of being breathless or short of breath upon mild exertion, something like walking up a gentle hill or climbing a set of stairs. And this is in the prime of life, well, I like to think of it as the prime of life – around age 45. It shows that there are real differences contingent on social circumstances from early in life.

So then we think well, how can that happen? How could that possibly be? What would be the links? Well, there are a number of different theories to account for these lifecourse effects of earlier life conditions. For example, being exposed to various things in earlier life might set us onto a particular pathway or trajectories of exposure to other risk factors during our lives. Or being exposed, for example, persistently to poverty or persistently to cigarette smoke or to air pollution would accumulate and build up over the life course and lead to poorer outcomes in adult life.

I'm going to change tack a bit now and turn the focus to some of the work that we've done on the influences on early child health and development more recently in our centre.



SLIDE 8

I'd like to ask you a question – this requires a bit of audience participation: I'd like you to think back to last night, what you were doing last night, I'd like you to think about what time you went to bed, what time you think you fell asleep and what time you woke up this morning and quickly calculate the number of hours sleep you had last night.

Okay. Could you raise your hands please if you had less than six and a half hours sleep last night? (approx. 25%) And if you had somewhere between six and a half and eight and half hours? (just under 75%). And if you had more than eight and a half hours sleep last night please raise your hands. (just a few individuals). Well,



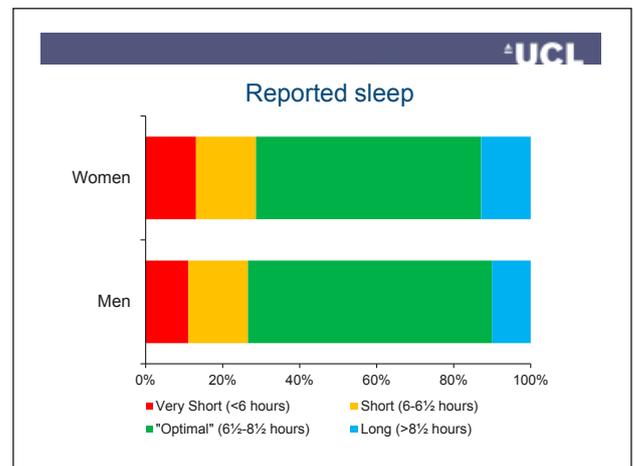
How much sleep (to the nearest half hour) did you get last night?

www.ucl.ac.uk/icls

you guys with less than six and a half hours, I'm afraid you fall into the insufficient, inadequate, short or very short sleep categories. And it's all a bit doom and gloom, but you're not alone.

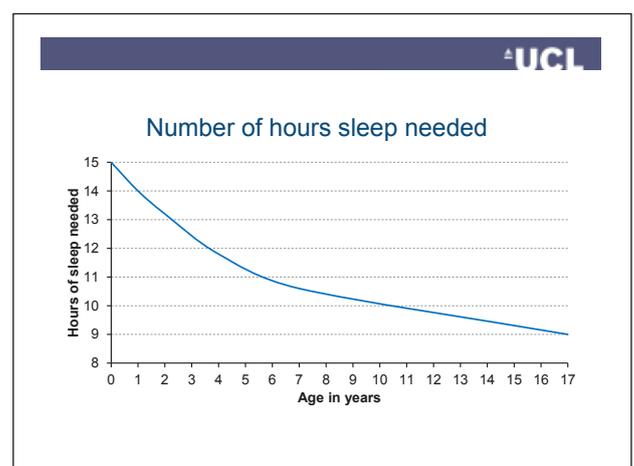
SLIDE 9

This slide, from a large household survey in the UK, shows the distribution of sleep in the general adult population. As you can see, just over a quarter, which is about the same as you – you're a representative sample – about a quarter of adults in the UK report having insufficient sleep or short sleep night after night. And just under two thirds have the golden six and a half to eight and a half hours of sleep a night.



SLIDE 10

But of course there's enormous variation within individuals and there's enormous variation across the life course in terms of the amount of sleep that we need. And this next slide shows you for children and young people, which are those I'm particularly interested in, the number of hours sleep that they need in a 24 hour period. So for example, a very new born baby would need somewhere between 15 and 18 hours sleep in a 24 hours period, and of course that comes down sharply, so by the time you get to five years of age a child needs about 11 hours sleep in a 24 hour period, and by the age of ten about ten hours. And adolescents still need



eight and a half, nine hours sleep so if any of you have adolescent children and they think they know better, they still do need their sleep.

SLIDE 11

And why do we need to sleep? Well, if we don't get enough sleep it leads to an enormous number of physiological and functional differences so for example if you don't get enough sleep your immune system is affected and you tend to get more colds, pick up more infections. If you don't get enough sleep the endocrine system function is also altered in some cases. So for example, hormones levels that affect appetite are altered, leading to increased appetite which of course has associated with it an increased risk of overweight and obesity. When we don't get enough sleep we get more aches and pains because those essential repairs to muscle and connective tissues doesn't get done. And we're more emotional labile, more tearful, more irritable because the systems that govern emotional regulation need us to sleep.

And the same for learning too. Cognitive function is incredibly, profoundly influenced by the amount of sleep individuals get. Because of the plastic changes that are necessary for

UCL

Sleep helps to maintain healthy function

- Immune system
- Release of hormones
- Muscle repair
- Emotional regulation
- Memory consolidation

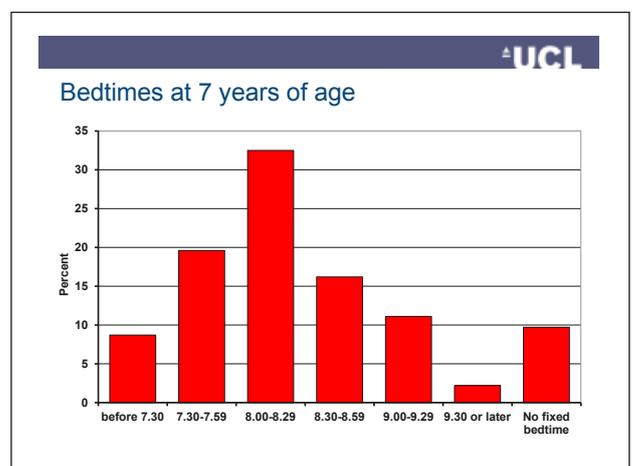
www.ucl.ac.uk/icls

us to learn. So everything we learn something new the new neural assemblies go to work and they are consolidated when we go to sleep and then we go through the same thing for the next day, your neural network is getting stronger and stronger and stronger. So learning is very heavily influenced by the amount of sleep that we get. There's quite a well worn phrase in sleep research around learning that sleep is the price you pay for learning on a prior day but it's also the investment that you need for being able to learn new things on the next day.

SLIDE 12

So we're interested to look at sleep in young children. Most of this research has been done on adults and on teenage individuals who were taking examinations, most of the research relates to dips in sleep routines in the amount of sleep you get to those health outcomes that has been done in these older populations. Very little has been done in young children and certainly very little has been done using large population samples of young children. So we had a very interesting chance here to look at the links between markers of sleep, markers of sleep routines and markers of child development. And this research was published just last year.

Firstly parents of children were asked about children's bedtime routines throughout the early childhood so ages three, five and seven years. Parents were asked about the regularity



of bedtimes that children went to bed. And this slide shows the distribution of those bedtimes. So this is for seven year old children. You can see that the most common bedtime is between eight and eight thirty. For some children, some went to sleep or to bed earlier than that and others went later. So around 11, 12 % of the sample

went after nine o'clock and about 9% of them didn't have regular bedtimes. I'll come back to that because that's quite important for what I'm going to show you.

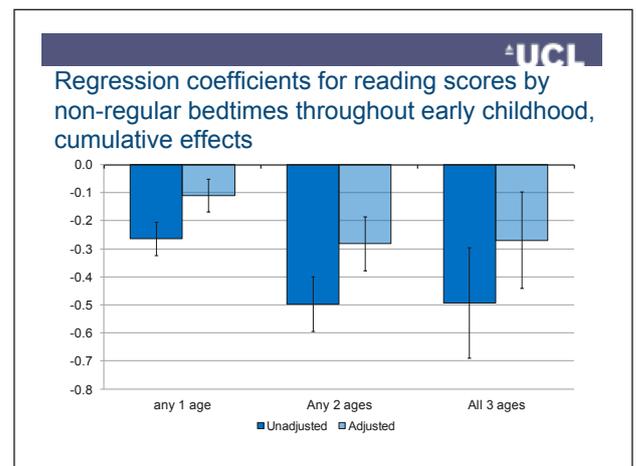
Now there's a whole lot of research – we don't know what time the children actually went to sleep – but research from other groups suggests that children on average go to sleep around thirty minutes after going to bed. Sometimes I would question that myself... but that's what the research tells us. So for example, a child

going to bed at 8.30 could arguably be asleep by 9 o'clock and then the average time of getting up with this age group is between 7 and 7.30 with school runs and so on and so forth. This was weekday bed times. So a child going to bed at 8.30 would probably have around ten, ten and a half hours sleep which is about right if you think back to the graph I showed you about how much sleep children need at a particular time in terms of age.

SLIDE 13

And what we did was we wanted to see how markers of children's development were correlated with these bedtimes. And we found that children who had earlier bedtimes or later bedtimes had worse scores on things like reading tests and maths scores and tests of spatial abilities and also had worse scores in terms of their behaviour. But when we controlled for, when we adjusted for in a statistical sense, a wide range of co-variant factors – things that would influence this relationship – we really found quite modest relationships between the actual time children went to bed and their behaviour and their cognitive function scores.

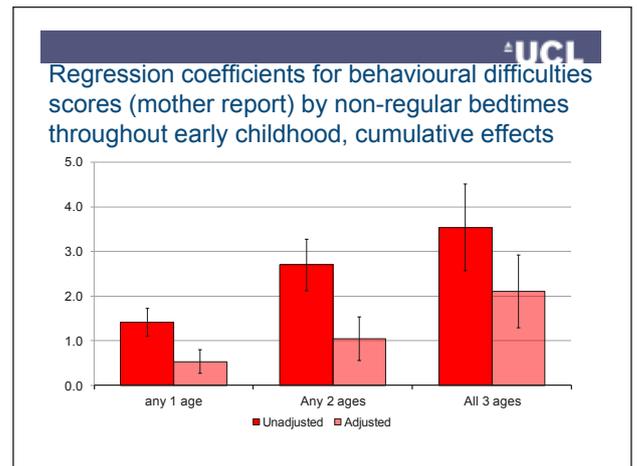
However, we did find a strong and stubborn relationship for the children who did not have regular bedtimes. And that makes sense in terms of when we don't have regular bedtimes, it's a bit like experiencing jet lag, so the body clock, the circadian rhythms are thrown out. And that throwing out of the body clock and the disruption of circadian rhythms influences children's ability to learn, so their cognitive functioning and cognitive performance and emotional regulation are affected. So some results we found that children who never had regular bedtimes their reading scores – the same is true for maths and social abilities but I'll just show you reading – their reading scores are much worse than for children who did have regular bedtimes. The children who didn't have regular bedtimes throughout childhood had the



worst scores of all and those differences were around 0.3 of a standard deviation which are by no means trivial.

SLIDE 14

When we look at the picture for behavioural problems – this chart shows behavioural problems rated by the parents or the mother and you can see a stepwise increase in behavioural problems scores – an increasing score is bad. And again these differences were really rather large in terms of what they might mean for a child's actual behaviour.

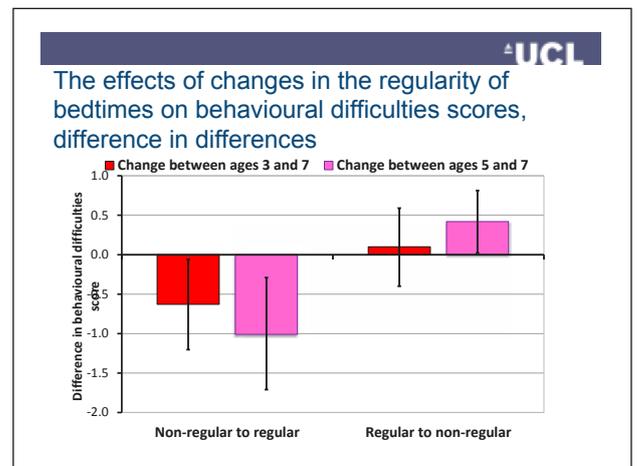


SLIDE 15

So we saw these accumulating relationships, remember before I spoke about the persistence of an exposure throughout life would theoretically lead to worse outcomes, we saw these accumulating relationships for markers of cognitive performance and for markers of behaviour as rated by mothers and by their teachers. Then we went one step further, we wanted to see what happened for those children whose bedtime routines changed, in a way simulating experimental conditions. We found that for children who changed from not having to having regular bedtimes that there were improvements in their behaviours. And we also showed less strongly on the right hand side of the graph that children who changed from having to not having regular bedtimes that their behaviours worsened.

That summarises our research on sleep routines and we'll continue to do this work on other markers of health.

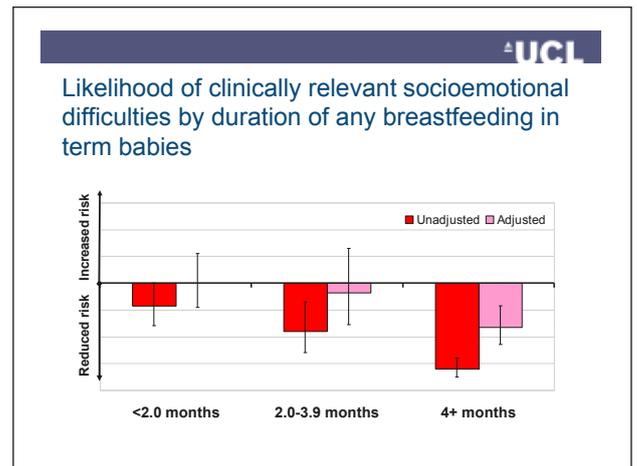
And in fact, we've just got the latest sweep of data for the Millennium Cohort Study which came out yesterday (24 February 2014) so we're busy looking at the data from these eleven year olds and we'll be continuing this line of enquiry as these children get older.



SLIDE 16

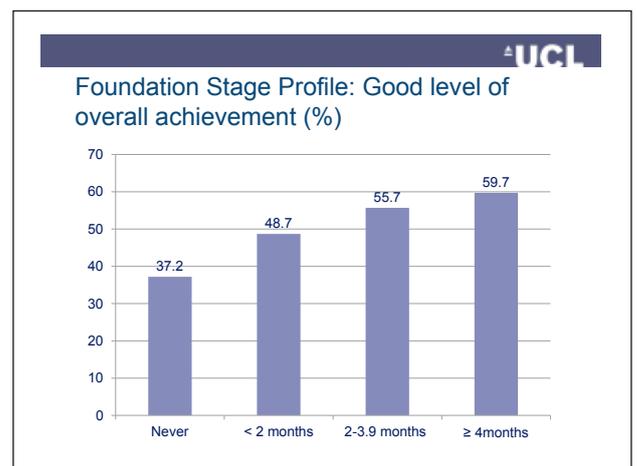
Now the next example I'm going to show you and I'm not going to go into too much detail – my colleague, Amanda Sacker, who's here, spoke earlier in the lunch hour lecture series about the links between breastfeeding and health (See OP10 transcript <http://bit.ly/1aS91yj> or You Tube video <http://bit.ly/1phBzbd>) so I'm not going into too much detail – but I will show you a couple of examples. Early work that we did on breastfeeding demonstrated very stark social inequalities in the rates of uptake of breastfeeding. So most socially advantaged mothers were about twice as likely to initiate and to continue breastfeeding compared to socially disadvantaged mothers. So these inequalities are stark and there are a lot of improvements that could be made in terms of population health because breastfeeding has been linked to benefits for not only the infant but also to the mother.

This slide, compiled with colleagues from Oxford University, shows the relationship between the duration of breastfeeding and behavioural difficulties at five years of age. And as you can see the longer the breastfeeding is continued for the greater the reduction of risk of behavioural difficulties.



SLIDE 17

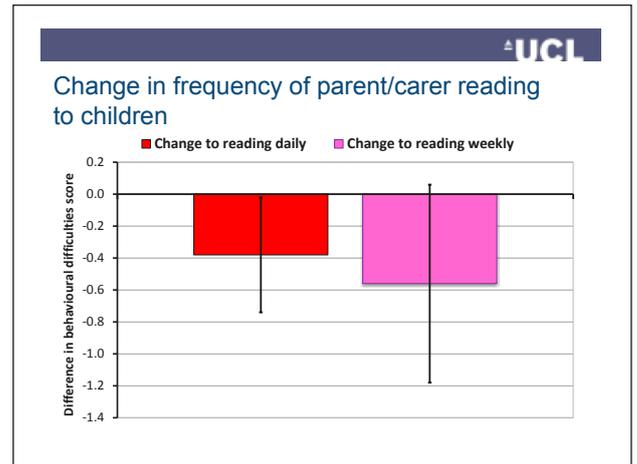
The next slide shows a similar picture but for foundation stage profile results, as assessed by the school the child is just entering at age five. And again you can see the longer the child is breastfed for the more likely they are to have a good level of attendance in the foundation stage profile. So 59% of children who are breastfed for about four months or more versus 35-37% of those who were never breastfed.



SLIDE 18

The next example I will show you relates to something that parents commonly do with their children: We're told as parents that reading to our children is a very special thing to do. And it is quite a special thing to do because it taps into all sorts of interactions at all sorts of levels. It's not just the flow of information of the written text that's in the book, it's the degree of intimacy associated with telling stories and reading stories with and to young children. And we find very, very strong correlations between reading to children and their own reading scores and their own maths scores and all markers of cognitive performance as well as to their behaviours.

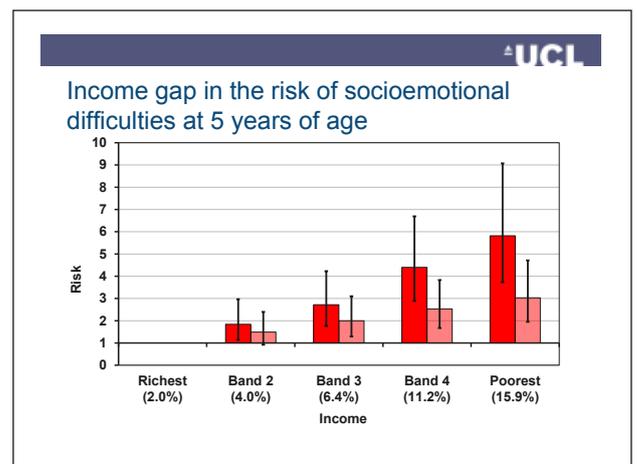
But again in a similar vein to what we did with the bedtimes routines work was we looked at what happened when we see a change.



So for parents, for carers who were reading less frequently, if they started to read more frequently to children during those very early years, here are the changes between the ages of three and five, there are resultant improvements in the child's behavioural scores.

SLIDE 19

Okay. That's enough about individual influences, I think. I will turn my attention now to inequalities in child health and development. What happens if we take account of all these things, these proximal risk factors and some of the other risk factors in relation to various aspects of children's health and development? This is from a paper we did a couple of years back in which we wanted to look at how much the home learning environment could account for income gaps in markers of child development. So we started off by looking at their behaviour scores and their verbal scores when they were ages three and five years of age. And this chart shows you the results for the five year olds. You can see that there's this strong graded relationship. So it isn't just a difference between the best off and the worst off in society, it's a strong graded relationship from left to right, from the richest to the poorest, a stepwise increase in the prevalence of behavioural difficulties. And these are clinically relevant behavioural difficulties at age five. It's



about an eightfold difference across the income distribution.

We made some adjustment, so we adjust initially which is the first set of bars here we adjusted initially for breastfeeding, whether the baby was born low birth weight, their gestational age, and we explained some of that gap because you know, there are huge inequalities, I've already talked about breastfeeding, but birth weight too, so children from socially disadvantaged backgrounds are much more likely to be born low birth

weight, to be born pre-term. So these are important markers of very early markers in child development that we have to build into these models to try to make sense of the results that we're seeing.

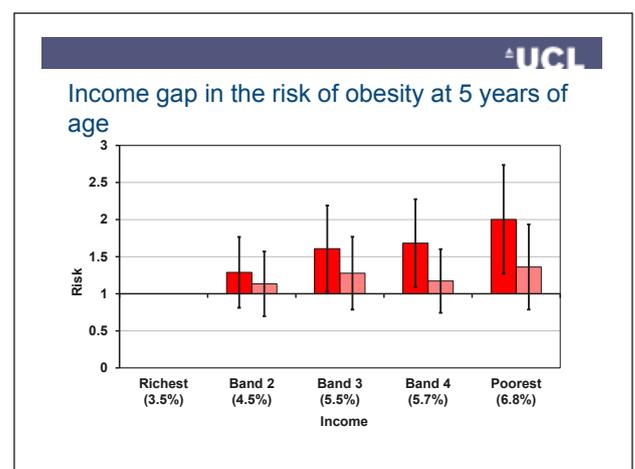
We also then in our second step factored in a number of markers of home environment, so we looked at markers of parents' mental health, the parents' literacy and numeracy skills, the activities that they reported doing with their children, so things like reading and playing with them, telling stories, playing music, that kind of thing, going to the library. A whole range

of what we would think of perhaps as learning activities. And when we adjusted for those things we reduced the odds of having clinically relevant behavioural difficulties from around six, around six fold to around threefold. So we were able to "explain" the income gap to around 50%.

When we ran these models for markers of verbal ability we found that we were able to explain about a third of the gap. The converse of that is of course that we weren't able to explain up to two thirds of the gap for verbal ability and half of the gap for children's social and emotional development.

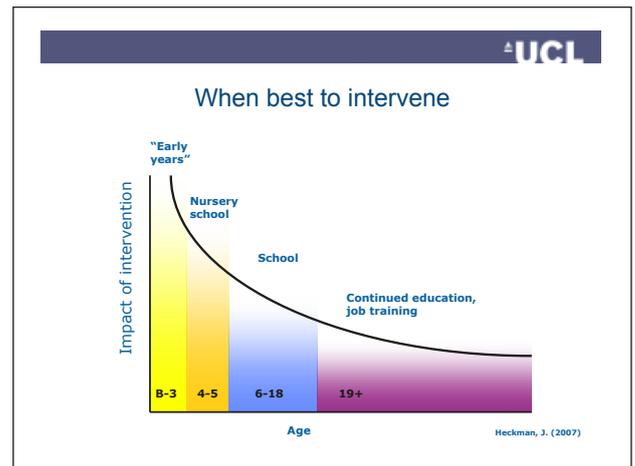
SLIDE 20

In the next example – and this is work in progress – my colleague Alice Goisis looks at the income gap in the risk of child obesity again at age five. And you can see that already by five years of age there is a twofold increase in the risk of obesity. Not overweight but actually the sharper end of the distribution of obesity, contingent on family income. And here we looked at, we factored in additional markers of what was going on in the proximate environment around nutrition and around physical activity, so things like watching TV, doing sports, doing various activities, computer use, whether the child had breakfast each day, the amount of fruit and vegetables they ate, of course all the things to do with bedtimes and mealtimes, we factored all of those things in, and as you can see the gradient is reduced from about a two fold risk to a risk of around 1.4. So in epidemiological terms we would say that we'd explained about 60% of the gradient for the risk of obesity at age five.



SLIDE 21

That's some work we've been doing on social inequalities in early child health and development. This next slide depicts the impact of intervening in the early years and the value of intervening at various points during childhood and adolescence. And as you can see this is a slide taken from a paper by the economist James Heckman, which shows the greatest economic returns for society are when interventions are carried out in the very early years. But if you dig a bit deeper into the policy discourse around this particular area where we're looking at early interventions and whether they work. It is incredibly complex to assess whether interventions actually work. Often there is a sense of dismay where early interventions are shown to work – that children have better social and emotional competencies, are more ready to learn, are less likely to be obese,



they're generally healthier in their development – but then the longer run impact of these interventions are more difficult to demonstrate. And one of the reasons for this is probably the experiences children have in the education system. So when we intervene we also have to make sure that young children have high quality experiences once they enter the education system.

SLIDE 22

I'll draw to a close now and I will conclude by saying, I hope I got the message across that early child health and development are important, both contemporaneously and for future health and for the risk of mortality right throughout the life course..

In terms of explaining social inequalities, we might be able to explain a third or a half or two thirds of the income gap in various markers of health and development, but we don't succeed in explaining the rest of those income gaps. We need to look, and policies need to take account of, the more distal influences on child development as there is a tendency to put the onus on parental behaviours in relation to their children's development which deflects attention away from the distal, societal, influences on children's health and development.

And lastly if we're going to intervene, the best returns are those related to early intervention but these need to be backed up by prolonged exposure to good quality education.

UCL

Conclusions

Early child health and development is important:

- Contemporaneously
- Future health and life chances

Socioeconomic inequalities persist:

- Proximal and distal influences

Early interventions maximise pay offs

www.ucl.ac.uk/icls

SLIDE 23

Thank you for your attention. This research has been funded by the Economic and Social Research Council (ESRC). The lecture can also be viewed on the UCL You Tube Channel <http://bit.ly/1ncsEZx>

