Interview Transcripts

International Edition

Names starting with H to M

This document contains transcripts of the expert interviews in *The Science of Early Child Development, International Edition*. Transcripts are listed alphabetically by the name of the interviewee and the name of the video clip. Click on a name below to go to that person's interview transcripts:

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Hertzman – benefits of population-based surveys (1:16)

The idea that we have created through international organizations, the United Nations, WHO, the Convention on the Rights of the Child, etc… we've created mechanisms for global conversation is very important. And out of those things potentially comes, if you'd like, alternate governance mechanisms. So for instance promulgating the early development indicator as a tool around the world sounds like a narrow technocratic activity but in fact, there's a dialectical relationship between the sort of narrow activity and the broad consciousness raising. The fact is is that if you can get an active measurement using a tool like the EDI or using the UNICEF's mix survey or whatever, you can generate data, which forces discussion. And part of the discussion that needs to be forced is what we would call commensuration. That is to say to get people to understand the coexistence of physical, social, emotional language and cognitive development together. Things like the EDI force that and force you to think about those things in common.

Hertzman – healthy development (4:02)

It's a pleasure to be here with you here today. The talk is called Equity from the Start and it's about the importance of Early Child Development as a social determinant of health. Based on the work that we did as the global knowledge network in early child development for the international commission on the social determinants of health. The international commission referred to their chapter on early child development as Equity from the Start and this explains the science behind that.

The first question I'd like to address is this: Why is early child development important and particularly important for people like you to think about? And the answer is very simple. It's because it is a determining influence on subsequent life chances and health. In other words, the conditions of early childhood and early child development go on to influence health, wellbeing, learning and behavior throughout the balance of a child's life course.
This animated graphic shows very clearly why that would be true, and what it shows basically is that in those early years and as you can see along the bottom axis it shows from zero through to seven showing the preschool and the early schooling ages, that there are a whole series of different basic competencies that the developing brain is developing, and when they are at their maximum sensitivity, that is to say when each of these curves reaches the top, they are sensitive to the environments where children are growing up. That's what sensitivity means, so brain cell to brain cell connections are being made and irrelevant connections are being sculpted away and they are occurring according to the qualities of the environments that children are growing up in. You can see that there is a whole series of different major competencies here.

But what I'd like to do is focus your attention just on three to four and five. During that period of time, the child really needs a lot of opportunity to have a consistent set of faces up close at about 13 inches or 20 centimeters or 25 cm I should say at the focal length so that they can start to recognize facial expressions and encode facial expressions in terms of emotional information. This is what allows attachment to occur, and children who don't get strong visual connections in those early years then have very much trouble understanding the information that human faces provide them around and are at risk for a number of negative social outcomes because of that.

Another example is the pair of emotional control and habitual ways of responding. Here what we understand is that in a critical window between age 2 and 5 is the greatest chance we have to help children become helpful and empathic and to get away from being physically aggressive in their social interactions with other children. So it turns that out in the second year of life, as children are mobile enough to interact with each other physically that a large proportion of them simply declare themselves to be physically aggressive. And it is during this period of time then that if the kids are in strong, nurturant environments that we can transform those physically aggressive responses into language which allows them to develop negotiation skills.

A third example is language development itself and as you can see the peak of sensitivity here is reached at about age 2, but the brain is highly sensitive to language development throughout the early years. What we know during this

period of time is, is that your ability to understand language, and your ability to express language in the ways that you need to do in the modern world goes up as a straight- dose response with the amount, and the richness and the variety of language that you hear in your day-to-day living. So children who don't hear much language spoken to them or only ever hear it spoken to them to give them orders will have a much more restricted ability to understand language and express themselves in language than children who are asked questions, who are read bedtime stories, who are talked with about their thoughts and their feelings, who adults get down at eye level with them so that children can decode the social and emotional information that goes along with their language. And these are the principle concerns of early child development.

Hertzman – fostering early development (3:34)

Everywhere in the world we do see socioeconomic gradients in children's development. But everywhere in the world we also see trend buckers. We see resilient children and resilient families. That is to say families that are able to create an intimate environment around the child which transcends socioeconomic circumstances, that is stimulating and nutrient in ways that allow kids to be able to take advantage of all sorts of opportunities.

If you think about it, what do kids need? Well obviously they need food, they need hygiene, they need a rich and responsive language environment, they need protection from disapproval, teasing and punishment, they need opportunities for self-expression. But any one of those can be disconnect from the social circumstances of the family as long as there's in effect food and hygiene. So that the vast majority of the places now there is access to basic food and hygiene. So even in sub Saharan Africa for instance surveys of parents have shown that over 80% of parents feel that they can provide those rock basics for their kids and what they want is 'education', which means the opportunity for their kids to develop.

So within families then and within supportive communities, if you can get around the child a group of adults and older children who understand about how human development works then the possibility of creating environments which are optimum for development is large. And in fact if you have environments where there is multi generations, where this is arrange of different adults close to the child and all the rest of it, you can actually get environments that would work better than nuclear family environments. I mean the problem that we've got in our society is that we've moved in the direction of the nuclear family, we've moved from the direction of full participation in the economy. And the premise of the nuclear family is that the parents that you have been dealt are the best nurturers for you, right. And that may be true but it may not be.

If you could imagine a more traditional village environment where there are a range of adults around, it may be that the adults that you resonate best with are not your immediate family and that was more traditional. However what's happening now globally is because of the way the global economy is working there is no society in the world where children, where more than 25% of children have daily access to extended family. Well that's starting to break down. And yet going back to my favorite slum in Nairobi, when they finally moved to universal access to education they actually found that the highest functioning primary school in the country was in one of these slum areas. And this was an area where the family dynamics and the community dynamics were positive enough to transcend the fact that there wasn't much money around for instance. So we know it can happen. And it may in fact be easier in societies where the mechanisms of social distance that have emerged in Western society are not as deeply embedded yet.

Hertzman – key factors (2:41)

As I said, the importance of the early years is that it influences the rest of the life and so by the second decade of life, we see that children who have not had a good start are at an increased risk of school failure, of becoming pregnant early on in life, and of getting involved with problems with the law and criminal justice. By the third and the fourth decade of life, they are at more risk for obesity, for elevated blood pressure, and for depression which is a huge problem throughout the world. By the fifth and sixth decades of life, they are at increased risk for heart disease and for diabetes and then late in life they are at increased risk for premature aging and memory loss. We know this because children have been followed from birth right across the life course, so this is not rhetoric, this is about real measurement of how the early years influences health and wellbeing as well as learning and behavior across the entire life course.

So then, that raises a very important question. What actually are the key factors that influence early child development? Now many of us get caught up in empty discussions about this. Sort of is it family or is it society? And the key word there is “or” that somehow or another it’s gotta be one or the other.

This little graphic with the ducks shows you what’s the problem with that kind of thinking. Here we have a mother duck with her babies following her along, doing what a mother duck is supposed to do. But in this second panel here, you notice that she encounters a social condition that is beyond her control and she has to navigate her babies through that social condition. And what happens? Well you can see at the end, only one survives. So, is it family or is it society. Is she to blame or is society to blame? And clearly the answer here is, that we have to have a partnership between family and society, exactly the way we have committed ourselves to in the convention of the rights of the child. So that families want to do the best for their children but they need support from society at all levels and I’d like to talk more about that.

Because the answer to the question is really this. That early child development depends upon the experiences that children have. Like we’ve talked about before, the human faces up close, the language, the opportunities to develop socially and emotionally and that those experiences occur in the environments where they live, learn and grow up.

Hertzman - population health (2:16)

Well, population health is the study of why some groups of people in society, in regions, etc., etc., are healthier than others. And so in a society like Canada, one could ask, you know, why are non-aboriginal people healthier than Aboriginal people? Or why are people, as you go up the socio-economic spectrum, increasingly healthier than those as you go down the socio-economic spectrum.

It turns out when you actually delve into the question of population health that a lot of the factors that determine whether or not people live healthy lives as well as have a high sense of well-being and competence, really emerge from the early years of life. That's one of the things that's come out of our study of population health. In particular, early language and cognitive development, early social and emotional development and early physical development all contribute to health across the life course. And so people who are interested in early child development need to understand that what they're doing can have a life-long impact on health.

I think there's good reasons to believe that what goes on very, very early on does have a long-lasting effect. Now, one has to be very careful when one says that because some people think that means you're saying it's all over by age X. And it's difficult to get people to understand certain kinds of population context. What we're really saying is if you take 1000 children who are not doing well on one or more of their domains of development by the time they reach school; you take another 1000 who are doing well; and then you watch to see where they are 10 years, 20 years from now. On average, what you will see is the 1000 who are doing well will be doing better than the 1000 who weren't. However, within each of those groups there will be huge variations. There will be kids who are doing great going into school who are doing terribly 10 and 20 years later. More importantly, there are kids who will not have been doing very well who will be doing great 10 or 20 years later. Right. But on average, those are the differences that you will see, right. And so it is difficult to get people to understand how to think in these population terms and understand what we're saying.

Hertzman - steep gradients (1:09)

In the context of developing countries there are some things that are very similar and things that are different. One of the things that we discovered with the work that we're doing is is that the, even in very poor countries, the steepness of socioeconomic gradients in health is not necessarily greater than it is in wealthy countries. That is to say if you go to a place like Kenya and you look at things like infant mortality and low birth weight rates in the privileged part of the community, the poor part of the community and the squatter communities on the edge of Nairobi you see difference in the fraction of kids who die in the first few years of live and the fraction who are born low birth weight. And they vary about 2 or 3 to 1 from the top to the bottom. But in Canada the differences are about the same size. So its one of the interesting things that we saw in developing resource poor countries that the gradients are very present the way they are in wealthy countries but they're not more unmanageable then they are in wealthy countries.

Heymann – child outcomes (1:14)

I think we should be able to know that all children have a chance at healthy development; that they are all ready to start school. So much when you look at unequal outcomes in primary school; when you look at unequal outcomes in secondary school; that's all been determined by the state children were at when they were five. We need children to be able to have an equal start at school, which means they have to have had enough health, nutrition, development at that very beginning that they have an equal chance. That they're really starting at the same starting line. So we should be measuring that and we can. Right now, we're really just measuring the most basics across countries. Do children survive? Of course, that's crucial but that's not enough to know if they're going to have an equal chance to thrive regardless of their gender, regardless of where they have a disability, their race, ethnicity, their income, their social class. We need to begin to measure, are they all ready to thrive?

Heymann – comparable data (1:44)

All of our countries can benefit from truly comparable data. Now each of us may want to compare our experiences to different groups. So we may think that the country's experiences who are most relevant to us are those in our region. They could be those who are in our income group. They could be those who share political systems or societal structures to ours. But we can always benefit from looking at other countries that we think are truly comparable in saying what are they doing that works? And as well as sharing what are we doing that works. Because of that having information across countries on basic issues. Do mothers have paid leave; do fathers have paid leave? Can breastfeeding breaks be taken? How affordable is early childcare; how is it made affordable? What nutrition programs are there? What programs are there to support parents and other caregivers in stimulating children? That allows us to look at who's getting the most successful outcomes and what can we learn from those successes. Now, of course, each of our countries and in fact each of our states or provinces will also have some questions that are very specific to our local circumstances. So it's important to add that kind of data and information that allows us to answer our local questions at the same time.

Heymann – economic investment (1:52)

I think there are two things that mistakenly often keep countries from investing in young children. The first is the notion that it competes with other investments, that we have to take away money from something else to invest in early childhood. And while that may be true for a very brief time, the returns to investing in young children are so powerful in terms of better economic outcomes for their families, better economic outcomes as the children grow, better educational outcomes, reduced adverse outcomes that it more than pays for itself, this is totally affordable. The second is that we think it's just easy to forget about young children. They're not claiming policy makers' attention. They're not organizing in the streets and they seem so resilient and of course in many ways they are resilient, but the price of not investing in them is enormously high, and the return is extraordinary. So I think the question for all of us is 'how can we motivate our own governments to make this investment that we know could have such a powerful impact on the lives of everyone – on the lives of the children themselves, on their lives as they become adults and on the success of all our societies.

Heymann – policies that support parenting-1 (2:02)

There is so much that countries can do that's transformative for parents and for young children. So just to give a few examples: Many women want to breastfeed, not all women can breastfeed. So we know that the major World Health Organization and other agencies concerned with all of our health recommend that mothers breastfeed exclusively for six months. But if you're at your job and they do not allow you to take a break to breastfeed, you won't be able to no matter how much you want to. If your family depends on your income, you need that job. So what can countries do and what in fact, are two thirds of countries around the world doing? They're guaranteeing leave for mothers to breastfeed. The other one third could step up to the plate and start to do this. Any country that can afford to give breaks for lunch for an adult can give that break for a mother so that she can feed her young child. That's a simple example. Another incredibly important area is parental leave. So when there is a newborn child, do parents have time with that child? We know those first weeks and months are particularly critical and the care needs to be one on one or one adult on two children and the way for that to be accomplished is for parents to be able to take that leave. 187 countries, nearly every country, gives paid maternity leave. The number giving leave for new dads is only about half as much. We have much more progress to make there. But also there's still a few countries that don't including the United States which could afford to.

Heymann – policies that support parenting-2 (1:54)

I think one of the attitudes we have to beware of is when we assume that if parents are not providing enough care to 0-5 year olds it's either because they don't want to or they don't care enough to. So often for families the reasons that they're not providing care is they have no choice. And we know that from interview studies we've done of families around the world. So I'll just give some examples of a 19 year old mother who was single mother; her husband had died, working 15 hour shifts in a factory 7 days a week with an 18 month old child. It doesn't help to tell that person, spend more time with your child. She desperately wanted to spend more time with her child. What helps is to make sure she has; can earn a livable income with decent hours that allow her to spend that time. I think there are just so many examples of this. A second area where are; where broadly held misconceptions sometimes I think get in the way, is how much we forget about fathers' roles. Fathers are so critically important in children's lives, just as mothers are. We need our national policies to reflect that. Part of not only gender equality, but children doing well, is giving fathers equal leave, making sure they have sufficient time when they're newborn children, when children are sick. That should involve men and women.

Janmohamed – corporate social responsibility (3:05)

We have done a lot of pioneering. We were the pioneers in terms of tourism in Kenya, in Tanzania and I think the, our mission is very clear. It's; yes, profits are important. Our projects must be self-sustainable but we've got to make a difference whether it is, you know, with the local communities that live around where we are present, whether it is with our staff, our human resources. We invest quite a lot in their capacity building, training them, developing them. When it comes to environmental issues, you know, we will not develop a property unless we have carried out environmental impact assessment studies to make sure that we're not going to damage the environment.

Wherever we are we will, we will look at what difference we can make whether it's; a good example in Tanzania when we first started, perhaps 80 % of our supplies used to come from Kenya or South Africa. Today, 95% of our supplies are local. So over a period of time we encourage local suppliers to meet our standards, to try and you know, meet our standards and you know, gear up to supplying us. We've done the same in some of our remote areas wherever we are. And I think, you know, this is, this is very important.

We are very fortunate to work for an organization that really values a lot of these you know; whether it's the environment, whether it's being responsible, transparent, making an impact in the areas we are in, you know this is pretty unique. And I think that is satisfying. We are just not judged on the amount of money we produce. If you look at our board reporting, there is a whole section on what, you know what we do whether it's for the communities or on our reforestation programs or turtles in Mombasa.

We believe that we must conserve nature and there are many such examples where we have demonstrated that, you know, we've got to be responsible players**.** We've got to make sure that, you know, we are making a positive impact where ever we are.

Janmohamed – supporting children (3:41)

We have a project that just recently started where we are establishing libraries for children and in fact we have already in Kenya established 19 community libraries and these are communities that live around our properties, you know, where we have our lodges or camps. We got seven staffed libraries that we've set up. And our next stop is moving to Tanzania where we're hoping to set up 12 libraries for children and one in Uganda. One other initiative that we started 3, 4 years ago which we are very proud of; you know, every Christmas our 24 properties in Africa used to spend a lot of money on Christmas decorations, you know, lighting. And we decided, I think it was 3 years ago, that we would perhaps stop spending money on the glitter and look at the new initiatives. So all our 24 properties, you know, did have a Christmas tree and we partnered with an orphanage or a school and we asked the children to write to us telling us what they'd like for Christmas. Obviously those were controlled, so we didn't have requests like a Ferrari or; a toy Ferrari, yes. And, you know they; we put the scrolls on the trees and we said that we would contribute towards those gifts instead of spending money on lighting and decorations. But we also gave our guests an opportunity to contribute and it's amazing. I remember in Uganda, the first day, every scroll was taken up by one guest. So we then immediately went to another school. And, you know, it is very satisfying so this has now become a tradition and I believe that across Africa maybe we would; our; we could be talking about close to 1000 children that benefit out of that initiative.

Another initiative that we have in Rwanda where we support some of the genocide victims; children and in some cases also females. So recently we've partnered with another party to try and get them to grow mangoes and some other fruit that we use in the hotel. We provided the you know, the resources, the seeds and we think in 2 years they will be suppliers to the hotel. Now, we also support the genocide orphans' home and some of those children, I think, if I remember correctly, some of them are in fact now working for us.

Janmohamed – supporting education (2:31)

We've recently started what we call 'sunny money' where, you know, in some of the remote areas in East Africa obviously children have a problem because there is no mains electricity. So we partnered with a company that produces solar lamps and we are contributing solar lamps to the schools. Our teams have been out there to see the impact. And the impact is amazing because they're able to do their homework, they're able to, you know it's made a big difference because they're encouraged also to read and their performance in school has improved. You know, and I think it's not just giving, giving gifts. We also try and have initiatives where we get them to actively participate. For example, deforestation is very important in East Africa where you know, we've seen a lot of deforestation; sometimes out of ignorance. So wherever we have forestation projects like around Mount Kenya; what we did was we invited school children to come and plant trees. Hopefully, they will be our future leaders and they will remember that they were asked; they were planting trees and destroying them is not the right thing. And in return we will give them; we will help them with their computer labs, we will give them our old servers. So you know, and they actually come every weekend and you know, will water the tree or the plant. And I think it's more than just giving goodies. You know, it's also getting them to participate and understand that you know, I'm sure they obviously ask the question 'why are we planting trees' and there is some education and these are future leaders. So hopefully, I hope that the impact will also be felt in many years to come.

Janmohamed – supporting employees (2:53)

I just consider myself very fortunate to work for an organization that values and supports the other; you know all these initiatives. I think I'm very fortunate and I think you know, a lot of our staff feel that way. You know we; I remember many years ago we had an HIV/AIDS program, which eventually turned into a wellness program. And that to me again is you know, is great because you know many years ago when HIV was looked down on you know, we encouraged all our staff to get tested. We assured them that there would be no victimization and we would help them. We managed to get some organizations to help us to provide us with ARVs. We provided those free of charge to our staff and a lot of them led normal lives and then worked for us for many years. You know in some cases those who were; and this was about 10, 12 years ago, those members of staff who were positive, we even had a counselling team where we encouraged them to get their partner and children tested. Now one story I'll never forget where one of the members of staff once came to me saying you know, I was; before I had my family tested -and fortunately they were all negative- he says I was having nightmares. I was about to commit suicide because I didn't know how to handle it. And it was our staff who counselled him, who spoke to the family, got them tested and his life changed from one day to another. Now you know, we hadn't really; that was not the agenda but that was the result of an initiative that the company implemented. We spent a lot of money getting them tested, treated, providing ARVs, counselling them and so yes, there are some great examples which are very satisfying.

Janmohamed – supporting families (3:27)

In Ngorongoro, for example, we allow some of the Maasai women to come and sell their wares just outside our restaurant. We have explained that they must not hassle the clients. They must just display them and if the client wants to buy then they would come and buy from them. You know, and it's small beaded stuff, jewelry. And we thought our contribution was to the ladies and you know they had something, some cash coming their way. And about a year ago there was an external person in fact from the Prince Sadruddin Aga Khan Fund who went there and he talked to them. And his feedback to me was that the ladies told him that since that initiative was started, they've always been able to meet the school fee commitment for the children. Now that was something that had never even, you know we hadn't even factored in. We thought, okay that gives them the opportunity to earn some money but, you know, when he spoke to them and said what do you do with the money, the unanimous reaction was we pay our school fees. So you know sometimes some of these initiatives also, when we don't realize the real impact and if that gives them some pride and they're able to meet their school fee commitments. Again, you know in East Africa, for a lot of the parents you know, education is very important. So, yes there are government schools but they have to make contributions, they've got to buy uniforms for them, they have to buy them books. So, you know that again is a great initiative. The other area that we also try and give children opportunities is when it comes to their, you know when they've had some; they've finished school but are unable to go forward. So we will take them on and you know, train them on techno-vocational skills whether it's working in the garden, working as mechanics, you know doing blue collar jobs. Now we can't employ them all. It'd be impossible but when they go away after their training period and we just give them a per diem and feed them, they go with a letter saying they've been training with Serena lodges or hotels. You know that is a-that gives them the opportunity to find jobs. So I think it's, you know a lot can be done without necessarily spending huge sums of money.

Janmohamed – supporting local environments (3:01)

You know, people are much more sensitive, not just to you know, looking at what charitable initiatives there are but also in the environmental front and that is something that is very important. You know, I'll give you an example: in 1994 we were building our lodge in Ngorongoro. Our environmentally backed assessment study had clearly confirmed that a water source we had on our lodge grounds on our site was you know-we should be able to use for our lodge supply. As we were building, we had a German professor who had, who knew the Ngorongoro area extremely well. He was living in Arusha. He came and saw me and said, look, you know my advice to you is that you do not use that water source because every 5, maybe 10 years, 15 years there is a serious drought and the Maasai need that water for their cattle. Now, under the law, we were empowered you know, we were allowed to use the water. When I brought this matter to the attention of the Aga Khan Fund, IFC and at that time CDC who were our partners, they immediately said listen to the advice and we invested in a 9 kilometer water pipeline to tap water from another source. And you know I'm so pleased we did it because this is not every 15 years- we are faced with a drought, well you know dry conditions every 5 years. Now again, you know, it is great to see when you're staying at the lodge you see all those Maasai children who will come in with their cattle. Now had we been sharing that water, you know they would have had to go down to the crater to get water for their cattle. So you know it's, these are also issues that we want to now document, highlight and share with our guests in a proper manner so they recognize that you know, they're just not staying in a hotel where it's all about profits; that there is a lot more to it.

Jenkins – differential parenting (3:02)

Differential parenting is really about children being treated differently within the family, and it tends to be examined on things like differential warmth and attention and things like negativity. So does one child get more shouting at than another? Does one child get a lot more sensitivity from the parent? Does the parent seem to understand one child much better than another child? Children are sensitive to those differences and they think about those differences. Now, a lot of what we see is absolutely innocuous.

One child is younger than another, and the kid totally understands that the reason why they get more attention than so and so is because they are younger and they need more, and the older kids recognize that and they make allowances for that. What kids tend to get really upset about is experiences of unfairness. So when they feel that an adult is more connected to a child, then those experiences of unfairness start coming out, and that's what we need to pay a lot of attention to.

When you have higher levels of social disadvantage, then as I've said to you, you have greater differential parenting. The parents get spread out, more reactive to individual idiosyncratic aspects of the kids, and when we take account of parents, what we call their reflective functioning, so we interview parents about their own childhoods, their own experiences in their childhoods.

Parents that are more reflective do less of this differential parenting even when they're in these high risk circumstances. So, again for me, that's an intervention pathway. It's really saying let's think about our experience of being parented and parenting our own kids. Let's think about what these kids need on an individual level, and then let's try and bring those things together in the way that we parent our kids.

It's about explaining why I needed to do this differently with Joe than I am with Sam, just explain it, and talk about it, and make the kids see the fairness in what your rationale is for it, and for them, their internal experience of it will be better.

Jones – epigenetics (1:03)

So the word epigenetics actually means on top of genetics. And so what we mean when we talk about epigenetics is the sum of the modifications to DNA that don't change the sequence of DNA itself but that change the way the DNA is used. So you can think about it like light bulbs. If you imagine that all of the genes in your genome are light bulbs, then the genetic sequence determines what shape the light bulb is going to be or what colour it's going to be. But the epigenome is like a dimmer switch on those light bulbs. It changes how bright that light bulb shines.

So we know that people's genes affect their health, they affect their personality, they affect their lifestyle. We also know that the environment affect those things almost as much. And so the epigenome is a wonderful way of finding real evidence, biological evidence that those things interact together to influence our lives and our health and our personalities and what we do.

Jones – prism model (3:32)

So one of the reasons that we think epigenetics is so exciting and so applicable to human health is we think it might be a mechanism or something called the developmental origins of health. The DOHaD hypothesis. So developmental origins means that in utero early life exposures that we talked about might manifest years or decades later as health outcomes. And so we're using epigenetics to try to see what is this sort of memory of these past exposures that sticks around. It's a concept called biological embedding. The idea that exposures can leave behind a biological residue that can manifest later on in sort of a different kinds of health outcomes.

And the way I like to describe the role of epigenetics in the DOHaD hypothesis is if you imagine the way light hits a prism. So a prism in this case, the prism we're talking about is the sum of all of your genome and your epigenome together. The genome is static throughout your lifetime but the epigenome is changeable.

So if you imagine an exposure like a beam of light so something happens, you could have poverty or adversity and it's a specific kind and colour of light and it hits this prism. That prism is the current sum of your genetic and epigenetic status of yourselves. And you know that when light hits a prism it refracts into a rainbow. And so the quality of the light and the shape of that prism affect what that rainbow's going to look like.

And so in this case, the rainbow is the possible health outcomes later on. So the way we like to think about this idea of biological embedding is that early in life when you have a sensitive period of development, if you have a specific kind or type of light that hits this prism, it can actually alter the epigenome and it can change the shape of that prism. And that in turn of course will change what the rainbow looks like, what the outcomes can be.

What we think happens is that in certain circumstances, this combination of environment and then that change to the prism can stick around. And so that's what we look for in our epigenetic research is indicators later on in life of an early life exposure that's resulted in a change in this prism and alter the possible trajectories in that possible rainbow that you get at the end.

I came up with this model, I was thinking to myself, "How do we express the idea that changes to the epigenome result in a change in trajectory but it's not a deterministic thing?" We're not getting to saying that changes to the epigenome where you're going to end up here. There's still a spectrum, it just changes sort of where the spectrum is. And that's where I came up with the rainbows. Rainbows sort of make sense when you're talking about health spectrums. So I like the prism model because it really describes health in terms of trajectories and not in terms of destinations. So that's the nice thing about this, the idea of a rainbow because it's a spectrum of health outcomes from point A to point B. We don't necessarily know what those points necessarily are. And so specific early life exposures may alter the probability that you're going to end up in one of these two ends of a spectrum but it's not a deterministic model. It's not that you have this exposure, you're going to end up with this particular health outcome.

People are complicated. And there are so many other individual factors that affect this but it is about this sort of shift in potential risk or opportunity that I like to use the prism model to describe.

Jones – prism model example (1:57)

So one example of how this prism might work is there's a particular animal model called Agouti viable yellow. And it's a funny name but what it means is it controls the colour that these mice turn out to be. So it controls their hair colour. And Agouti viable yellow is really interesting because if you have just a regular population of mice that have Agouti viable yellow they are on a spectrum from yellow to brown and lots of different sort of modeled in between colours. And so I like to use that as a visible representation of how that rainbow would look at the end of the prism. So you have brown mice at one end and you have yellow mice at the other and they're always in between. And so the way this works if you feed a pregnant female mouse regular mouse chow which is a thing that you could buy in the store, you can buy mouse chow. Then you get a smaller sort of spectrum.

Typically, you get mostly like mid-yellow, mid-brown offspring. The mice turn out to be medium yellow, medium brown. But if you alter her diet, and you change some of the macro nutrients in the diet, you actually get - change that prism. Her offspring's epigenome changes shape and that result in a different spectrum of coat colours.

You get more yellow mice or brown mice depending on how you change the diet. And that's an interesting thing. You get different coat colours, that's cool but what does it mean in terms of health is mice that are very, very yellow, mice that are very, very brown, when they're young, they're very similar.

But as they grow older, the yellow mice become quite obese, they become insulin resistant and they get all hallmarks of mouse diabetes. So this is an indication that an early life exposure doesn't change a maternal diet during pregnancy result in this sort of shift in the spectrum because of those changes to the prism that can result in much later life health outcomes that are different between the two ends of that rainbow.

Kadenge – care for child development (5:15)

What we are building upon is the existing service delivery systems that we have and continuing care practices that are there within the country. But what we are just asking that be amplified is the component of play and communication which we consider to be very significant in supporting the stimulation of children and in their growth and development. So what we see is through the experiences that we had in the first training that we had and the clinical sessions that we went through, that is was possible for caregivers who came to hospitals or to health facilities to receive a little information that would assist them to understand the significance of play and communication in terms of helping healthy development of their children. So we see Care for Child Development coming up as a, not as an addition or a stand-alone program but to augment what is already going on within the communities, within the health facilities, within the child care centres, within homes just to make it possible for parents to engage a little more in play and communication activities with their children so as to stimulate growth and development faster for their children or in a better way.

I just amplify the significance of the Care for Child Development package. During our clinical practice when we had the regional training in Kenya in Machakos, one experience that highlighted the significance of just being able to pass these messages to caregivers was an experience with a mother who had an 18-month-old child who apparently to her was blind from birth. And she said that this was a confirmed fact and we asked her so do you play with this child and she said no, this child just sits I can't play with her because she doesn't do anything. And in my interaction along with my colleagues with this lady, one of the things that we asked her was do you think this child hears? And she says yes. Do you think the child wants to play? And she said I wouldn't know. So we asked her to just do simple activities and hold her finger, try to click the fingers, just use basic common activities, you know, touch her cheek and so on and find out whether the child would respond. And she said I find that bothersome because I think she's just there. And so when we asked her and encouraged her to do it, she actually saw that the child was reacting. Then something hit me and I asked have you taken time to actually test this child's eyesight? And she said well the doctors said she can't see. So I told her there is a simple activity of just passing a brightly coloured piece of plaything before the child's eyes to see if the child's eyes will move. And she said that I have never done. So would you be willing to try? And we said, ok, fine. Let's try it. So I began without using the plaything, just used my fingers to make movements across and to our amazement and her own amazement the child's eyes followed. And we asked her what are you seeing? And she said I am seeing that the child's eyes are moving. So we asked her then OK can you do it yourself and see if this is really, really happening. And she did that and we asked her what do you think that tells you? That there is residual eyesight. This child can actually see and has been seeing everything that you do. And the mother was awestruck. She looked at us. Tears flowed from her eyes and she said this is a miracle. I have never believed that this has happened. But we told her do you realize that you missed out on those opportunities to just interact with this child and that the child has been watching you all these years possibly wondering why mom does not talk to me. And she said this is mind changing. And we told her you don't need to invest. It didn't cost you money to do this, no. Is it something that you can do every day, yes. And she said from now on I'm going to talk to this child. I'm going to play with this child. I'm going to engage in responsive caregiving with this child and I thank

you for this opportunity to learn. At the health facility, having brought her child for an ordinary checkup, this mother has a life transforming experience and I believe that's where Care for Child Development is taking us. Transforming what would be ordinary in to the extraordinary and achieving better outcomes for our children.

Katz – reading skill and disposition (1:39)

I often talk to teachers about the distinction between having a skill and having the disposition to use it, and the best example I can think of is that you want children to have the complicated skills of reading, but you want at the same time, that they have the disposition to be readers. It is possible to find learning to read, especially in the English language, which is one of the worst, so painful that you'll never read when you leave the school building. In which case you've got the skills but not the disposition, but of course it wouldn't be much use to have the disposition to be a reader if you haven't got the skills. So the important thing for us, as teachers, is to say, to ask ourselves, "How do I help children so that they acquire both together" the skills and the disposition to use them? And by the way there is some evidence that children who are around adults that they see reading frequently, doesn't matter what they read, the point is young children who are around people whom they observe reading tend to learn to read more quickly or more easily, or with more enthusiasm, shall we say. So the question is how do we help children to acquire the skills and, at the same time, the disposition to use them, and that's true of all skills, it's having the disposition to use them. And a lot of that depends on whether they're reading something that is interesting, not necessarily easy to read.

Katz – self definitions (2:24)

Interesting research, a large body of research now suggests that unless children achieve at least a minimal level of social competence by roughly about the age of six, they will be at risk for the rest of their lives. Because, not because they can't, just can't learn, but because once a child has experienced being defined as unlikeable or has been avoided by peers, then that child tends to define itself as unlikeable, and we've got plenty of evidence that children will bring their behavior into line with their definition.

Like sometimes the child is defined as the class clown, well this child from the studies we have, would rather die than not be funny, because that's his identity or her identity, and that's the same with the child who's unlikeable, and that, generally speaking, that child's avoided, and what we do have reason to believe now is that when those children like that are teenagers, they find each other. And they solve the problem of being unlikeable by joining together with the shared bitterness for the rest of society. So they have the experience of closeness based on shared bitterness, and they would rather be, make trouble than solve their problems, because if they solve their problems they won't have the shared bitterness so they'd lose the closeness, so getting the social development right in the first six years is hugely important, and by the way, we know a lot about how to do that, and I've spent a lot of my time with teachers helping them to help different kinds of children with these problems. But most children we say, for the sake of the discussion, all children who see themselves, by the time they're about six, as unlikeable, have to be helped by an adult. They cannot solve the problem by themselves. But we do know how to help them.

Keating – early interventions (0:46)

We know a lot more about how early we can detect reading difficulties and what sorts of things we can do, and how early we might be able to detect autism; what kinds of things we might be able to put into place that would mitigate those things. We're not going to be able, I suspect ever, to make a truly dyslexic child exactly like a child with fluent reading, but we can in fact build the workarounds that make that happen quite well and quite competently. We're not nearly as far along that road in autism as we are in dyslexia, but I suspect that we are going to get there, we are beginning to understand that the earliest interventions are the best and understanding how to get those services delivered early are very important.

Keating – gradient effect (3:33)

Well basically the gradient effect speaks to the issue that as we go from the simplest and to the more complex that at the simplest level it is the case that there are always gradient effects in any developmental health outcome that we have looked at and any of the various aspects of developmental health we have looked at and the gradient effect just basically means that individuals who are at the lower end of various kinds of indicators of social status and which particular ones we measure makes some difference to the specifics of the outcome but it doesn't seem to make a difference in the overall pattern.

So if we look and things like household income and we look at things like occupational prestige of the parents or if we look at things like educational level of the parents. If we use that as our indicator of social and economic status what we find is that individuals who are lower in that or natural children who are in families where that is lower will tend to have lower developmental health in any of those various indices compared to individuals who are a bit higher and they will be lower than individuals who are a bit higher than that. So one of the aspects of the gradient effect is that it tends to go up as a relatively what we call a monotonic function or a straight line function. It just simply goes up. That's true for virtually everything that we've ever looked at in virtually every society. That's the simplest level.

The next level is to say that when we compare one society to another what we generally find, and again across many different outcomes of developmental health that we have looked at, we generally find that those societies that tend to have steeper slopes, that is where the difference, the added increment or the added value in terms of developmental health, you get by moving up the socio-economic status and that's a very steep gradient. You tend to have an overall lower level of performance of the society. When that gradient is flatter, that is that there's still an increment in all societies but when the increment that you get as you go up tends to be less stark than in the steeper gradient case, that the overall functioning of the society and the individuals in that society is higher.
So basically the gradient effect in that sense is that steeper slopes of societies tend to go with lower means.

Flatter slopes tend to go with higher means. One other level of complexity to that is that when we look at the socioeconomic status across longitudinal studies across following the same individuals over long periods of time is that instead of using that individual's own SES socio-economic status in the measure that we will look against developmental health and instead use the SES of their family, the SES that they had when they were children we wind up getting very similar results. They're different in some specifics but in terms of the overall pattern it's actually very similar kinds of patterns. That these gradient effects appear at some level to become part of how the individual will function. It's not to say that it is the only factor and not to say that it's an absolute determining factor but it certainly is to say that it's a significant factor particularly at the population level where if in fact we don't take account of these issues we maybe wind up with, in a society, if we wind up with steep-low gradients it undercuts our ability to function as a society and it means that we are creating more problems than we need to create in terms of how the population functions with respect to all the various outcomes of developmental health.

Keating – parenting (1:31)

One of the most rigorous and replicated findings in all of developmental psychology is that parental effects do matter and they matter to a very substantial degree and that standard findings have been replicated also within that literature that essentially it's a combination of warmth and responsiveness of the parental figures in the early years particularly mother who's typically the primary caretaker. When the mother is the primary caretaker it's that warmth and responsiveness. Whoever the primary caretaker is that's an important thing, and by warmth it's obviously means kind of general acceptance, a sense of love and affection, emotionally communicated affection as well as responsiveness to needs as they arise, so responsiveness that's time sensitive; the younger the child, the more time sensitive those responsiveness needs are. So there's a warmth responsiveness dimension, higher being better, but then there's also a dimension that is in the area of expectations or demands; the sorts of things where parents place limits on their children that children get to understand that there are limits, because for many children, for most children, the absence of limits is a terrifying thing, so needing to have the structure of where the edges are in their behaviour, where the edges are in relationships, where the edges are in things that they do, is an equally important component to their felt security and to their ability to learn to function, to explore and to be comfortable in the world.

Kobor – epigenetic examples in the early years (2:19)

We have shown for example things like in our most recent work we have shown that it's the parental stress that kids are exposed to. And it's actually quite interesting in this particular work that we just recently published in collaboration with folks at the University of Wisconsin, and here at UBC, that actually it's quite distinct, so it seems like the stress of the mother affects these dimmer switches in infancy. In contrast, the stress of the father affects these dimmer switches during the preschool period, and even more specifically, it only affects it in the girls, versus the mom's stress affects both girls and boys. So that's quite remarkable and it fits very well with what people know about the interplay of parental influences and kids' behaviour during these developmental periods. We've also shown, and others have shown that as well, for example, early life socio-economic status can tweak with those dimmer switches. So for example, if you grow up in a low socio-economic status environment for the first five years of life, we can see that 20-30 years later in those dimmer switches in that they are set in a way that you're more likely to have inflammation and things like that in your system. That in turn then, actually we also found reassuringly, that can be buffered up to some extent by maternal warmth. So it's this kind of social environment if you wish that can set these dimmer switches. There's work out there that physical environment, certain chemicals in the environment can set these dimmer switches, so I think it's very early days for this research. And I'm looking forward over the next few years to have a much broader catalogue of influences that can set these dimmer switches and also perhaps to understand whether there are particularly sensitive periods. We always think that the early years are very sensitive, there's certainly evidence for this, but we haven't really tested in a longitudinal fashion how that actually develops over say the course of childhood.

Kolb – brain plasticity (2:12)

Brain plasticity is a word that was begun to be used in the 80s and has become a lot of things to a lot of different people. Basically it's the idea that you can mold the brain, that you can do this at various levels. So one level is behavioral. So if I learn something there's some plasticity. But what's the mechanism? Well I can look at it in terms of how the brain's organized and I can do that at lots of levels. I can measure electrical activity; I can measure genetic activity and so on. So brain plasticity refers to the idea that the brain is changeable but refers to it in a whole bunch of levels and we have to be careful when we talk about it, what level we're implying.

So during development the brain undergoes a sequence of developmental events. So you make cells, the cells migrate to the location that they need to be; the cells begin to differentiate; turn into a visual neuron or a motor neuron or whatever kind of neuron it is. The cells then form connections with other cells. In order to expedite this process so that it works smoothly, all sorts of growth factors are present in the milieu, the extracellular milieu. In development there's a lot of them there. And they're needed because you're making kazillions of synapses. Later in life, you're making modifications to the existing blueprint, if you like, that you made during development and then discarded a lot of. And so those growth factors aren't there any longer. Only certain ones are there.

And so what happens is it's more difficult to add the synapses later on. And that's a good thing because you don't want to go changing the brain all around and forget your mom's name. You want to keep these things in there. So the brain has to be less plastic, if you like, as it develops so that it keeps all the stuff that's in there that presumably is important. One way to enhance the plasticity later in life is to put in some of those factors that were in there early. So if, for example, you have a case of dementia or a case of somebody with a brain injury or something, you want to enhance that plasticity and bring back some of those factors. But remember that there's a risk here of erasing stuff that was put down earlier. So you have to be really careful about it. But that's why there's a difference between early and late plasticity.

Kolb – changes in play (1:32)

The second thing is if you look at play, it shows an age related change. So as animals grow older, the nature of their play changes. The rules begin to shift somewhat, which makes some sense. If you look at little children, infants playing versus five year olds playing versus 12 year olds playing, they don't all play the same, and that's true in other animals as well; there are changes in play behaviour. Now, one question we've asked is what if you manipulate the amount of play animals are allowed to engage in. So what we can do is we can say we'll take an animal when they're weaned and we'll place them with an adult animal. Adult rodents don't play with the offspring; they interact with the offspring, they'll tolerate the play for a few seconds then they don't want to do it. It's really one sided because it's rough and tumble play and you couldn't have an adult male rat playing with an animal that's a fraction of his size without hurting the animal probably. So we've got the situation where we take away the infants, or the juveniles now, place them with an adult, or several adults, so now we've manipulated the number of animals that are there. Or we can have them live with one sibling, or several siblings, so controlled two things here; we've manipulated two things: the amount of social interaction which will vary with the number of animals you're living with, and the amount of play. The more animals there are to play with, the more play you're going to engage in, which makes sense.

Kolb – early brain development (1:11)

Historically we thought the brain was little when you were born and just got bigger so it was a small version of the brain that we have. But that's totally wrong, it's a different brain. And what nature has done is to use what I'm going to call the Michelangelo solution which when he made the statue of David he started with a big pile of stone and chiselled away most of it and he said that David emerged from the stone.

So our brain emerges from this infant brain which has more, about twice as many cells as we have and what we do is we post-natally get rid of and basically we have chisels which are hormones which are experiences and so on. So we get rid of cells, but neurons, but over the first two or three years we develop connections and we develop again twice as many connections as we need and then we start pruning them. And for some regions of the brain such as visual areas we prune really early starting by age three or four and we start getting rid of them. But for other regions such as the frontal lobe we don’t until we're in adolescence.

Kolb – noise and brain development (1:26)

One such series of studies we're engaged in now is in the effects of noise. Let's imagine that you're a pregnant woman and you're exposed to traffic noise, that's going to be a stressor. And so we're doing studies looking at the effects of traffic noise. And the people I'm doing it with are Iranian so we have noise from Tehran, traffic noise from Tehran, the animals are, pregnant animals are exposed to this during their pregnancy and what's the outcome of the babies. Higher levels of corticosterone for the rest of their lives, behaviours affected, changes in brain, all sorts of things are changing. The behaviour of the pregnant mom towards her pups after the noise stops is different than it would be if she had not been exposed to the noise. And so we're starting to study these things.

And I think the other thing in neuroscience we're now being able to get a handle on the molecular mechanisms cause it's one thing to say “Oh noise is changing the brain.” Okay, the next question is then how is it doing that. Because if we know how it's doing that can we now step in and say we can do this to prevent it from doing that? So that's one of the directions we're going.

Kolb - play and brain development (2:54)

So when we let the animals engage in play we can then look in their brains as adults and say what happened? And what we find happens is that the cells in the frontal lobe are profoundly altered, so the cells in this region in the rat brain which would be equivalent to probably this region in our brain, change their connectivity. They actually reduce the number of connections.

So we can control, we can manipulate two things: the number of animals you live with, and the amount of play you engage in. We can do that by having you live when you're weaned with one adult or several adults, or we can live with one littermate or several littermates. The more littermates you live with, the more play you engage in, the more adults you live with the more interaction there is with the other adults but there's virtually no play behaviour. If we then look in adulthood at the frontal lobe of these animals what we find is that both experiences alter the way the frontal lobe developed. It's counter intuitive in what happens because if you look at frontal lobe development in rodents or in humans what happens in you have this rapid increase in the number of connections which peaks in the frontal lobe of humans around five years, between two and five years and then shows this decline that's rather rapid through the pre-adolescent and adolescent period but actually continues until about at least age 30 years. In the rodent it's compacted, but it's the same logic, that is you have this increase and drop and during the adolescent period a rapid drop and then a leveling off into adulthood.

So what we find is a reduction in the number of synapses in this region related to the amount of play. The more play you engage in, the fewer the connections are, and you might think well that's a bad thing, you have fewer connections, but it's not. The number of connections whether it's bigger or smaller doesn't predict very much

So now what we've got is the frontal lobe, which is the brain's executive be influence profoundly by this early play experience. So what? Well, there's two ways to go here. One is to say, alright, if play's important for adult behaviour, what kinds of things during development will interfere with play? Peri-natal stress changes play; animals play less and the other animals don't really want to play with them. Peri-natal exposure, and then juvenile exposure to drugs such as methyphenoate, so stimulants in general actually reduce the amount of play and actually the play behaviour the animals engage in isn't normal, they don't follow the rules and so other animals don't want to play with them. Autism, you can fill in the blanks. All sorts of early experiences alter play. What's that mean? If you alter play, you're altering brain development. The frontal lobe isn't developing the way it ought to develop because of that change in play.

Kolb - prefrontal cortex (3:25)

So, the question is why do animals have a prefrontal cortex, why is it bigger in people, in humans than in other species, and the thing we have to recognize is that the prefrontal cortex was not selected by nature, behaviour was, behaviour that the prefrontal cortex is engaged in. So now you say well what is it that the prefrontal cortex's function is that was being selected for, which made it bigger. One of the things it does is it clearly is a way in which you can take all sorts of sensory experiences and put them together and make a single, unifying theory as to what's going on. So if I'm wandering around the world I've got visual experiences, auditory experiences, tactile experiences, I've got experiences that are internal, memories, things from the past, thoughts about the future and so on, how does it all fit together? How do I make some sort of story up about the world? The more complicated the information is that's coming in, the more complicated the prefrontal cortex is going to be. So we know that as the number of sensory areas increases in evolution, and it does, so if you look at rodents versus primates, the number of visual areas goes from three or four up to 20, 25 visual areas. That's a huge increase. So obviously whatever we're doing with visual information, we're really making the visual world more complex. The world we're creating is more and more complicated; the frontal lobe increases in lock step with that, so the prefrontal cortex increases with it.

So as that frontal lobe has gotten bigger and bigger, our schema that describes the world has gotten more and more complicated. One of the real complications is what I'll call autobiography. So if I said to you, tell me something that happened to you in grade three, you can not only tell me that you went to in my case Glengary school in Calgary, but you can tell me, well, we used to have fire drills and air raid drills and these were some things we did and I remember this experience that happened. I can also go in the future. That's autobiographical information that happened in the past, I can also say well what do I plan to do? I'm 65, what am I going to do when I'm 70? What's my plan? I can actually give you that plan. I'm willing to reckon that a chimpanzee who's got a pretty big frontal lobe does not have the capacity to recall a specific memory, although we can't really tell, from when it was young, that's a hard thing to determine, but I'm pretty darn sure it doesn't think about tomorrow very much, whereas we have this unifying element of time, past, present, future, that's in the frontal lobe, that's a unique sort of emergent property that we have. If you start messing with frontal lobe, you can lose that. You can lose the capacity to plan, for today or tomorrow. You can lose the link with the past in which case you cannot actually identify unique experiences that you had. You can identify experiences about, let's say grade three in my example, but you're not so good at identifying ones that relate to you. If you can't relate to you, and this is clearly going to make a difference as to how you relate to things in the present and in the future, so that's what the frontal lobe changes are about.

Kolb - sensitive periods (2:09)

Well, remember now, during brain development we go through a series of stages. So we have the generation of cells, the migration and so on. All of these things are occurring. And the brain when exposed to experiences at different times during those processes will respond differently. So imagine that you're in utero, if it's a human you're in the second trimester of development, the neurons are just being born, and you're exposed to various experiences. You can't change synapses cause there aren't any. And so obviously there's going to be periods during which the brain is more or less responsive. If you're trying to change synapses, which I've suggested is the business end, when is going to be the biggest time?

When the brain's making all the synapses. So there's going to be a period in development which turns out to be the first two years, roughly, in which we're making billions and billions of synapses and then we're getting rid of half of them because they're made, in a sense, poorly, it's a poorly designed system. Environment acts as a chisel, if you like, and chisels off the ones we don't need. And so that's going to be a period that the brain's undergoing massive change and therefore we can see it as a critical or sensitive period because events that occur then are going to act to facilitate synaptic growth and to alter the ones that are lost.

So the metaphor I give my students is that Michelangelo made David and he could've got a dump truck full of sand and glued it all together and made the statue but instead he started with a big block of marble and chiseled off the stuff he didn't need. And that's what the brain does. It starts out with way too much and chisels away, so you can have Michelangelo or you could have the Mona Lisa, if they made a statue of her, very different things, from the same block of granite. And so those are what those early experiences are doing.
Once you're past, once you've chiseled out enough, you're committed, and so the experiences will have a less effective role in changing the final outcome. You could change Michelangelo one way or another, the muscles not as big or whatever, not Michelangelo but David, the muscles aren't as big or whatever, but you can't change it into Mona Lisa.

Kolb - social interaction (2:04)

So the question we can ask is do kids have to play with other children or can they just play with puzzles? They're both kinds of problem solving, and I think they're both important kinds of problem solving. The studies of Tom Boyce suggest that the interaction of children and the way they engage in play-related behaviours is very important. That playing with puzzles or doing word games or whatever may be important for certain kinds of activities, but children set up social hierarchies when they play with one another, and these hierarchies are important in children learning how to engage with one another. If you think about the most complicated behaviour that we have, it's social interaction because, just give you a simple example, if I'm around my mother, if I'm a child for example, I'm around my mother or I'm around my friends, I do not behave the same way. If I'm around my mother versus some other adult I don't know, I don't behave the same way. If I'm around my conspecifics, my peer group, and it's made up of six individuals, and then another time it's made up of another six individuals but they might have an overlap of two, my behaviour might be very different in the two situations. Just watch teenage girls, I mean the way they interact with one another with one group of girls versus another is completely different depending on their experiences earlier. Males aren't so affected by those early interactions. So I think that those actual one to one interactions rather than one to puzzle interactions are really important for getting the frontal lobe up to speed in terms of how you keep track of all of this contextual information that you're going to need as an adult in a complicated world.

Does that mean that puzzles aren't important? No, it doesn't mean that at all. It just means that the social interaction is a really complicated form of problem solving. You need to do it to learn it; you can't be told how to do it.

Kolb – play mammals (1:50)

One of the real energy drains on developing animals is play. All mammals play, birds play, most vertebrates play, and they play, if you think about mammals, mammals play and there are rules. One of the rules they have is reciprocity; I get to do something, you get to do something. There are also rules with respect to sex. So the way males plays with males is different than the way males play with females, and females play with females. The details vary across species, but the story is the same. Now if we look at play, the question we can ask is why do animals spend so much of their time playing? Why would they burn up so much of the resources engaged in a behaviour that doesn't seem to have any function? So the obvious conclusion is it must have a function. So what it the function?

The other question we can ask is if we look at play, is there something about play that is affected by early experiences. So for example, if we look at early stressors, pre-natal stressors for example, do we find that animals play the same way? Do they play less? Do they play more?

Okay, so the question that we want to ask is what kind of factors influence play, and if they do, does that have some consequence down the road. So let's just talk first about play behaviour, and my colleague Sergio Pellis has studied play behaviour in all orders of mammals except cetaceans probably. About 60 species of monkeys, rodents, people and so on. And there's no question that all mammals play, there are rules as I described with respect to reciprocity, and the way in which they engage in the play, and there are other rules as well. That's the first thing.

Kuzawa – prenatal stress (1:46)

So there's more and more evidence now that if a mother is stressed during pregnancy, that this can permanently alter how the stress system in the offspring operates, and influence how they respond to stress. And so we have; there are good animal models of that, there have been for a long time showing that if you stress out say pregnant rats that the offspring will have altered stress physiology. But now we have more and more evidence that this also operates in humans. And so one example of that is actually is one of my former PhD students, Zaneta Thayer, who worked in New Zealand. And she worked with kind of a multiethnic population there. And she looked at measures of deprivation and stress during pregnancy; so she actually measured women during pregnancy; she measured their cortisol levels which is a stress hormone. And then she followed up with the babies after birth. And of course it's not ethical to stress out a baby, but we already do that when they go to the doctor and they get vaccines and this is a very stressful event that they already go through. What she did is she looked at stress hormones before and after that as a way to see how they are responding to that stress. And interestingly, she found a very clear relationship. The more stressed out the mother was during pregnancy, based upon her what she reported during pregnancy itself, the larger the stress hormone reaction of her baby at six weeks of age to that vaccination. Now we don't know that that necessarily traces back to the prenatal environment. It could be that those women who were stressed during pregnancy, also raised their kids differently in those first few weeks. But, it seems likely that part of what might be going on actually is an intergenerational effect of stress during pregnancy, that's a reasonable kind of working hypothesis.

Lee – cognitive development and lying (2:12)

So why are some kids who are telling lies at this young age and why are some kids don't tell lies. You know, the first thing that would come to your mind would be, 'ok, must be the parenting, the moral character in the child, but it turns out that's not true. So that's another surprising thing was that it is actually executive functioning. So if the child has a better executive functioning then the child tends to lie earlier so that's number one.

Another thing that's very interesting is theory of mind, so the child's ability to read mind. So the sooner you learn how to read mind and then the earlier you're going to tell a lie. So lying turns out to be something that is an indication of better development, at least in terms of cognitive development. So not something that is sinister or something that is part of your bad moral character, so that is very surprising to us. Another thing of course is by seven years of age almost everybody's child lies so you can tell lying is a very, very normal behaviour so I think that's something that is very surprising to us.

Another thing that is very surprising to us is as we age, as children age, by about 12 years of age, the lying rate actually drops down, back down to about 60%. We have no idea why but there is this U-shape to development, reverse U, so going up, up, up and then by 12 years of age you start to go down and that is also against our assumptions. We thought, you know, teenagers must be the worst liars… So they would be very more likely to tell lies than the rest of children's group. But turns out they don't which is very interesting.

Lee – cultural differences in lying motivation (4:26)

What really motivates a child to lie is a very big question. But, so what we have found, there are two basic motivations. One kind is basically to avoid punishment and to benefit, to gain personal benefits. So lying to cover up a transgression is one of those lies to - for personal protection. Typically, what happens in a regular household is if a child transgresses, and sometimes parents will say, "If you tell me the truth, I'm not going to punish you", but actually that's not true. So observational studies have shown that when a child confesses about his or her transgression, the parents always punish one way or the other. So the child learns very quickly, it's actually a much better way to avoid punishment altogether by just lying to cover up a transgression.

There's another kind of motivation that is we socialize our kids to be nice people to others and so this motivation is really instilled by parenting, by socialization. So, for example, white lies – so we want to be polite to others, we want, we do not want to hurt others feelings by telling white lies and because of that we learn how to tell white lies. White lies starts about three years of age as well but at the first the child typically tells it out of fear. For example, if they see someone giving you a gift you really don't like but you don't want to say it because you don't want the gift-giver to be mad at them but they are not thinking about - if I tell you the truth, you're going to be hurt in terms of your feelings. But with time, by about four or five years of age, they actually figure it out and then they start to tell white lies about 50-60% of the time and then the rate of lying goes up quite dramatically with age. So now they start to tell white lies to be polite to others, to avoid hurting another person's feelings. And that goes hand in hand with their understanding of why we need to tell white lies. So in North America these are the two major motivations.

But, however, in other countries, there are other kinds of motivation. For example, in East Asia, in Japan, in Korea, in China, in Taiwan, Hong Kong or Singapore even, kids also learn to tell different kinds of lies. So one kind of lie they tell that's very different from the kids in North America is to be modest. So for example, if you have got a very high grade from your exam, when your friends ask you how do you do in the exam, instead of saying "oh, I got 100", you can say "oh, I'm not very good". But in these more collectivist cultures you are not supposed to be different or superior to other kids. That's going to damage the cohesion among the group, so what you do is you have to minimize your personal achievement. So then kids learn to do that by telling so-called modesty lies and goes, younger age, 7 years of age, Chinese kids or Japanese kids don't do that. They still would be very proud, so "I got 100 or 99" or whatever. But by the time they get to about 11 or 12 they start to hide the fact they have achieved something that others have not achieved. So, and that goes hand in hand with the understanding of the moral norms of these, the cultures they are living in. So that's another kind of motivation.

Lee – cultural norms and early socialization (1:47)

In Chinese culture when you interact with each other, you're not supposed to look in to people's eyes. But in North American culture, you have to do that otherwise you be considered impolite and et cetera but in China, it's the other way around. So what we have found is, at about three or six months of age, babies are not that different when they're looking at their own race and other race faces. So they're typically looking at the eyes because eyes are very, very attractive to all the babies all over the world. But by about 10 months of age, Chinese babies start to avoid looking at own race, Chinese people's eyes. They start looking at the nose and Caucasian babies continue to look at the eyes. And then with age that doesn't change. So Chinese individuals, children, pre-school children, school-age children, adults, they'll be looking at the nose of the own race face but when we show them other race faces such as Caucasian faces, they are not afraid, they look at the eyes. So our culture actually shapes the way you look for, where you look in the face to make sure you comply with the norms of your society. And the surprising part is it starts that early, you know, about nine months of age they already learned about how to do it in a Chinese way, I'm talking about the Chinese babies. I'm sure the Caucasian babies in North America or most of the babies in North America probably are learning the norms of our society here and then they will be paying more attention to the eyes than the nose.

Lee – early preferences for familiar faces (2:05)

Children's visual system is very, very sensitive to what they see in the environment. For example, it takes only three months for them to realize that there are faces that their parents are that belong to one race and there are faces that do not belong to their parents' face. So if you are living in a mono-racial family for example, the child quickly develops the preference for own race faces at about three months of age. And by nine months of age, they start to recognize their own race faces better than other race faces. And by about 12 months of age, they start to have some kind of racial biases, for example, they like to learn from a person who is of their own race, a teacher who is of their own race. However, if you live in a bi-racial family or you're living in an environment where there are many, many people from many, many countries, like in Toronto, then they don't develop these kind of biases. So it's not because our parents are socializing our kids to be this kind of implicitly biased towards their own race but rather the visual experience is such that because if you see day in, day out your own race faces, it's inevitably you're going to develop these kind of biases.

Kids are so good at picking up statistics. So, for example, we also have done is to look at gender, you know, do you like male faces or female faces? Turns out, if you're raised by your mother most of the time and you tend to prefer female faces. But if you're raised by your father most of the time, you actually prefer your male faces at three months of age. So they just picking up the statistics in their environment and then they show these biases at that young age.

Lee – lying for the group (2:07)

There's another kind of motivation that also happens in North America but not very widely, is about lying for your group. It's called a blue lie. So telling blue lie is really for the benefit of a group and in these collective societies such as China, Korea, Taiwan, what's happening in these cultures is that you have to learn to be a member of the group and the group's interests, the group's goals are more important than personal goals and at some point you may have to sacrifice honesty in the name of collective. And it turns out that also motivates kids in these cultures to tell lies to protect the group's interests and benefits. So sometimes these kinds of lies actually are immoral because sometimes they violate certain rules but it's because you are telling it for the group, it's sanctioned by the culture. It happens also in North America, for example, sometimes police officers have been reported to tell these kind of lies as well in the name of justice. And the team sports – sometimes a whole team cheats in a game but nobody tells the truth about it because they want to protect the team so that happens in North America as well. So this is yet another kind of motivation that would drive people, including kids, to tell lies. So only by about nine years of age they start to do that and because they have understood what is expectation from their culture.

Lee – lying research (3:30)

The research about lying really is concerned with how children learn to communicate with others practically. Sometimes we as parents and educators always think honesty is the ultimate goal, one of the most important moral characters is actually honesty. Now we want our kids to be honest and that must be true all over the world. But when you look at, in reality, when you interact with each other, you actually do not, as adults, we do not tell the truth all the time. For example, we actually sometimes tell white lies, you know, you look great, your haircut is great, your dress is great and et cetera.

Our kids, we don't really teach our kids explicitly about these kinds of rules but at the same time we are teaching our kids not to lie. And so then they come in to situations such as a politeness situation, they don't know what to do and sometimes get punished, sometimes get scolded, sometimes get bad reactions from the people they have told the truth to. But then the question is how do we learn in one situation we ought to be honest because we know that most of the adults are very, very honest. But they occasionally tell lies and some of the lies are, you know, innocuous and some of the lies actually are told for politeness purposes. So then it becomes a very challenging, social task for a child and so that kind of intrigues me. How do we crack this mystery, you know, as a child, while we are learning language, learning the rules of society, norms of society and how to read, how to write, math and all sorts of things you have to learn. But how at the same time you also are learning this so that intrigues me.

One of the things we were very surprised by was the age by which a child starts to tell a lie. So it's about two and a half years of age which interestingly was reported by Darwin about his first son and he wrote the very first report about kids telling lies in a scientific journal and that's the very first… 1887, something like that, about his own son telling a lie to cover up his transgression which is to steal sugar from the kitchen at two and a half years of age, so interesting. So many years later, you know, I actually found evidence to show that's true. But any case, so two and a half years of age kids start to tell lies.

But another interesting thing is not everybody's lying, not all the two year olds or three year olds are lying – only a small group of kids are lying. So two years, two and a half years of age, it's about 25% of the kids who are lying. By three years of age there's about 50% of kids lying. By four years of age, is about 90% of kids lying, by seven years of age is about 100% of kids lying. So you have this interesting development or change and we have replicated this finding in different countries. Others have done so as well so it seems to be very universal, you know, when and how you develop the tendency to tell lies.

LeFevre – learning to count (1:20)

One of the most important things that children learn roughly between about 2 and 4 is how to count. And we can think about counting in two ways. We can think about verbal counting or what's sometimes called rote counting and that's just learning the string, the verbal string of numbers starting at 1 and going up as high as possible. And it's not just about memorizing those, although, that's what they do first. I'm sure we've all heard young children go, "1, 2, 3, 4, 5, 5, 6, 7, 8" and they don't really break it down into words. But eventually, they start counting in a more deliberate way. So verbal counting is one aspect of counting that's important.

But children also have to learn how to count objects. And so if I show you a group of four toys and say to you, "How many toys are there?", you need to learn a process for determining how many, pointing to each toy, saying the verbal label, which is why you need to know what the count sequence is. And then understanding that when you've pointed to all of them and said a word, that last word that you say is the quantity of the set. And that's referred to as cardinality. So both cardinality knowledge and verbal counting are often referred to as counting but they're actually two quite different separate kinds of knowledge that children need to learn.

LeFevre – mathematics and numeracy (0:52)

Early mathematics skills for young children is a good umbrella term for a lot of kinds of activities and knowledge that we would like young children to have about mathematics. Numeracy refers to a sort of subcomponent of that. The part to do with numbers. I would say that quite a large component of early mathematics knowledge does involve numbers.

It involves quantities, it involves verbal labels for numbers, it involves learning the symbol that goes with the particular quantities. So knowing what the number 4 looks like and being able to name it and so on. So numeracy is not a terrible way to talk about early mathematics but it's only a part of all the other kinds of mathematical skills that we would like young children to learn.

LeFevre – numeracy and mapping (2:23)

I would say that the next level of early numeracy knowledge in particular that children need to acquire is the knowledge of how quantities, once they know how to determine those quantities through counting, how those map onto written symbols. So if we think about the three kinds of representations that you can have of a number, the quantity, the verbal number word and the written symbol, learning the links between those we usually refer to as mapping. So children need to learn the mappings among those three representations.

In research that we've done, children as young as 2 and 3 years of age, a lot of them know how to name the symbols. So if you show them a 4, they'd be able to say 4 and they can say the count sequence up to 10 pretty easily. They may or may not know how to actually count the set of objects. So that's kind of the difficult part.

So between about 3 and 5, they're mastering that counting objects part of it with the goal eventually of being able to look at a written symbol and know how many that that symbol stands for without having to have five things in front of them. They know that the symbol 5, what it stands for.

So being able to map across those three different representations kind of forms the foundation for a lot of additional kinds of knowledge that children have to acquire. They have to understand for example, that six things is more than four things. They could do that if you show them six things and four things by counting them by probably 5, most children would be able to do that. But you also want them to be able to look at the digit 6 and the digit 4 and know that the digit 6 represents more objects than the digit 4 does.

So the research that we've been doing suggests that that process of moving from external concrete objects to understanding the verbal symbols and being able to map them between words and written symbols and then being able to work with those symbols as if you had the objects in front of you kind of from 2 to 6, those are the critical early mathematical processes that children have to acquire.

Levine – experience-based brain development (0:41)

It means pretty much what it sounds like. That the brain develops in a context, and the context is the experience that surrounds the brain on a variety of levels. Experience can be what happens to a cell as it's moving into place to form connections with other cells. And it can also be a whole organism life experience that may be formed by family environment or by the broader social environment by economic class and by a variety of other considerations.

Lye – three things the brain needs (2:46)

So I think we're at a very exciting time, we know so much about how the brain develops. We know that the brain essentially needs three things. It needs nutrition, because, and that's nutrition of the mother, particularly during pregnancy, because it's during pregnancy that the brain cells form in the child's brain, in fact, by the time birth occurs, that baby has 100 billion nerve cells in its brain. That's as many stars as there are in the universe, and as many brain cells as we'll have in our lives. So you need good nutrition, nutrition that produces energy because at the time of birth, most of the energy used by the body is used by the brain. You need good nutrition because you need a mix of calories and protein and lipids, a lot of the brain cells are formed of lipid, and so we need them. And then in addition to nutrition, you need stimulation, because once you form all of the brain cells, you have to connect them.

It's the connections between brain cells that form largely in the early first months and years of life that allow us to learn, that allow us to memory, and that provide the ability to develop social relationships. And these connections require stimulation. Early in life, the brain is like a sponge. the child is soaking up the entire environment around her, and stimulation from that environment helps form strong connections between the neurons that underlie our memory in learning ability. And then thirdly, the brain needs to be protected from abuse, neglect, and violence, because those circumstances result in stress within the individual and in high levels, chronic high levels, of stress hormones like cortisone that actually damage the formation of these connections and even damage the formation of the brain cells themselves. So a brain is a complex organ that underlies everything we do, and in order to build that brain, we need nutrition and stimulation and protection.

Mamade – positive deviance study (5:27)

In our work in Cabo Delgado, we saw through using as a tool, when we collected data on students and their age per grade. We observed that there was a group of children who exceptionally were at grade five at age ten which is the ideal. But we realized that those were kind of an exception. Instead of being the norm, all children being at that age, out of sixteen hundred we had some fifty in there. So, that caught the attention of the team, and then we decided, Ok let's go and see what is special to these children to be at the right age, at grade five.

We found that first for all this their families saw education as a tool to change the future, the future of their children to provide for different opportunities in life, for better opportunities in life. While another group the children who are twelve, thirteen, fourteen at grade five, their parents would say "Well it's good that they go to school because they can read, they can write, they can read a letter, so they can do something with it". But we didn't see the same type of association with the future and with future opportunities that these families particularly had. And we also to further probe that, we asked them what concretely do you do to ensure that your child will continue to progress smoothly and throughout education, their education experience?

And people would share with us that, for instance they already knew what the next school would be and they would have visited that school. Or that they have reserved some resources like a goat. So when the time comes to use that to buy the school materials, to buy uniforms if that was the case, to buy new clothes etcetera, etcetera. The second factor was related to all having someone, an adult who would help them with school matters, homework, things that they could not understand at school and they would resort to these adults for that. They didn't need necessarily to be the parents, not all parents were literate, but all children had at least either an older brother or sister or an uncle, an aunt from the extended family and they would have that support. So, the second factor was support from the family.

And associated with that, was that all referred that they had time their family spared for education at home, so they would have that necessary time. They were not involved in activities that would prevent them from having that time. And it lead us to the fourth factor which was that while all reported to do some type of work at home, none of them were doing work outside of their home, like selling food in the community, on the street, etcetera, etcetera, so they were, they had that possibility to be at home part of their time outside of the school.

The other factor we found which was interesting was that, all reported to like reading and reported to have had access to books. The most cited one were books from other grades, usually upper grades. And the other common one that families had other than text books were Holy books.

Another factor was distance from home to school and they were reported to spend less than twenty minutes walking from home, which is key, particularly for, to start at the early age. Parents tend to delay enrolment when school is far

away. So, having that possibility to attend the school which is close to your home or which is in your community is key for that specific matter in addition to other matters, of course.

Mamade – community initiatives (4:05)

Very often we have lots of information about the problem; we know what the problem is. We know that, we know about distance. We know about teachers not motivated. We know about schools not organized. We know about very poor learning conditions. So, that was important for us as a team, to embark on a different type of exercise, to learn about solutions. And based on the findings we have created, we have promoted through discussions with communities to start to promote community learning spaces.

Through these community learning spaces they would, children are enjoying the support from adults who are volunteers from the communities; they are called "Friends of schools", who can spare some of their time to be there with children and to help them with their school activities, with the school issues should they have. It also provides for opportunities for children to go and read a book for instance, which is something that we found that to be very important from that positive deviance study we did.

In addition to that, it addresses one issue which we face in our context, which is very few learning hours in school, for a number of reasons including the fact that we have two shifts in our schools. So, time for learning is reduced just because of that first of all. The second is that classrooms sometimes can be overcrowded, so learning conditions or conditions to read and write are not there necessarily. So, this hopefully can provide for that and we hope that this continues to grow and expand.

Of course we have others, like we could start to strengthen the linkages between early childhood learning initiatives and pre-primary school, as we learned that preschools work as a normaliser in terms of age, in terms of time of the enrolment at primary education. So, the child who has gone, who has had access to an early childhood center, community center at age three continues at age four, is there at age five, it comes as sort of a natural step to then go to school.

We have attempted to promote satellite schools. Satellite schools are schools that have, just have the initial grades and which are associated to one bigger school but they can be placed in the community, so that children at least when they are young, they can start school in their own communities. However, the government efforts to expand education for all, this is making also a difference.

Mansur - prep class (1:06)

My name is Nabila Mustafa Mohammed Mansur. I came approximately five years ago. My children were at school. My oldest son was just starting in grade one primary. Actually, I wanted to learn with him and teach him, but honestly, I couldn't understand.

With God's help and the people here, I started working with them and teaching my children as well. I became helpful to my children at home, and understand what they are learning and study with them. I found that the subjects that my son is taking at school are same as the subjects here. My son now in prep school. When I graduated from here it benefited me that I started studying with them. Thank God.

When I study with him, he became better at school and I understand what he is learning.

My father (God bless his soul) was tough, from Al-Sa'aeed [*southern Egypt*]. He didn't like girls to be educated. My older brother could go and learn, but for a girl, no, her place is at home. She doesn't need to learn.

I used to watch TV programs and my older sister used to teach me a few words. I liked that since I was young. So, when I had the chance here and heard about it, I came and submitted my applications.

Marfo – catching data (1:51)

Now, I bet you that these international organizations when they get the data are not going to analyse the local data. They don't think it's that important. I really don't. I'm yet to see a major project that gathered international data, that then reported findings for individual countries. We are always going for the gold. We can catch both worlds. And the way you do it is to make sure that there are the things that are instruments that get at the commonalities. Now, I'm not convinced, however that we even know how to capture what we call the commonalities, because very often when we say that it means that we have an instrument that was developed in Canada or the United States that we are going to try to use across the board. And even when we think we are trying to make it more valid for other places, we think of adaptations and very often what we mean by adaptation is translating it from one language to another. Actually the linguistic translation does not necessarily give you the basis for comparison because the conceptual underpinnings of those items could be very, very different. So in one culture you think of the concept of conservation and people understand it. You go into another culture, they have no idea what it means. So even the process of recognizing the limits of comparisons it requires us to do more. But guess what? To do more often it is very expensive or demanding of our time and effort and we are a world that believes in getting things done as quickly as possible and we use tools, not because somebody has decided that these are the best tools to use. Very often we use those tools because they are the tools we have.

Marfo – considering assessment (2:50)

Assessment is one of those challenging areas but challenging in the sense that for me when I look at how we look at assessment I think about how we are not thinking about assessment. And what I mean by that is that we tend to reduce assessment to taking tools, you know, that we know or that exist and applying them and looking at the results and the outcomes and comparing our children.

The only criteria I require is that we be thinkers about the assessment. So we pose the question – What are we assessing? Why are we assessing it? What's the outcome we expect to see? Then what is the tool that can get us there? But very often we're selecting the tool before we even think of, you know, what it is that we're going to assess.

If we're going to do be doing what works here, you know, in the developing part of the world and we really want to do research that gives us meaningful information, we need to worry about the tools that we are using. And that's the bigger point I'm trying to make, that we need to worry about the tools that we are using. It's not sufficient to take any instrument and I'm trying to think of one that has been used in different context, the name is not coming. But you translate it. You take any tool and then you – people have this picture of vocabulary tests, ok, PPVT? You know so it takes a very simple tool. You translate it in to something else you know, the language is adapted and everything and so you use it. Well sometimes you use this adapted tools and the results don't show a whole lot. So you're hoping that because you've used a tool and adapt it maybe the results are going to be very different. Well to do a good job the adaptation has to ask multiple questions. Questions have multiple levels. It is not just the word to word translation of the language. Now is the concept behind this, a concept that the children are familiar with right. Might you be able to take some of the item in the environment that would do the same thing rather than just picturing the same material that have been used? So there are more questions to ask in these kinds of; and so I don't have a solution as to which tools should be used but I think we need to be mindful that the tools themselves convey a cultural content, cultural baggage.

The more we want to do international comparisons and I'm not against them because, you know, it's a very, very important way of trying to understand, you know, differences in development across the world. And if we're going to do different, we're going to do something about it, we need to understand what some of those differences are. But we also need to admit that as soon as you put one tool in because it's been shown to work well in the United States or Canada; you have to worry about whether we are measuring the same thing actually.

Marfo – knowledge is complex (2:55)

There are people for whom knowledge is objective. We know the things we know because we have studied them scientifically. Or it is possible to know everything we need to know. You know that's one perspective. People might call it an objectivist perspective. Reality is out there. We can find it. That's one philosophical perspective. There are others who also look at knowledge as something that is not just an isolated, independent thing floating out there. That actually we affect knowledge even as we create it. That knowledge is actually something we construct. And if you believe in knowledge as something that we construct, then actually the idea that we would know the same things for all people doesn't make sense anymore. So all of a sudden knowledge becomes a bit more complex.

Coming back to the field of child development, I think more and more people are understanding that actually knowledge itself is a system. It's no longer the objective, you know, sort of set of ideas that most of us thought you know from one perspective, that something makes sense because of the way you look at it. So what does that mean for the field of child development especially for those of us who are interested in ensuring that we can tap in to the best of thinking, the best of evidence throughout the world. We want to tap in to everything that is wonderful out there. You know we don't ignore something because it doesn't come from our local environment. We need to be more universal, more cosmopolitan. We want to tap in to the best. But we also want to see how well the best that we can tap in to from any part of the world also has relevance and has meaning in the context in which we do our work.

There are parts of the world where we have taken it for granted that actually the best is elsewhere. The best of what we need is not with us and so we need to go outside to find it. And my message is no there's a lot of wonderful stuff outside but there's a lot of wonderful stuff inside. And if we're going to grow children who will be able to take care of their own societies, become critical parts of what we need to do fundamentally differently to move our countries forward. It has to be children who understand and have faith in their own societies and have faith in what they do as a people and their cultural traditions.

So finding our way to this place where I'm calling you know, context is really, really very important and encouraging people to look at their conceptions of human development not just in terms of what I've been giving them from outside the culture but also in terms of what they understand about what takes place within their own culture. It's one of the critical challenges of the field.

Marfo – outcomes (4:07)

So if I say that siloed research, especially applied work done in siloes is one of our biggest problems the other big problem is really the whole issue of how we actually address the issue of outcomes and how we measure what we do. And I think I've always used the example of even in the natural sciences where most of us would have thought that the natural sciences are so objective that you don't need to worry about what is different from place to place. Like a metal is a metal is a metal. It doesn't matter. You want to heat a metal to 600 degrees Fahrenheit, it's going to increase by about three inches, you do it Ghana, you do it in Canada, you do it in Singapore, chances are the answer will be the same thing. Human development is not like that. Human development is really primed by social and cultural processes. And so the context in which people live their lives is very, very important. So, but as human society researchers we are confronted with one problem with two sides. One side is biological existence. And of course, that is what we share. Human beings across all cultures, we share a common biological heritage. So the trajectories of development are driven by biological processes which do not vary a whole lot going from one setting to the other. But there is also the contextual path of our development. The culture in which we live. The geographic locations and, in fact, the social and cultural realm there are some elements that are universal. I mean, most cultures have families. Family is another universal concept. So it doesn't have to be biological to be universal. You can get ecological, environmental things that are actually universal as well. So here is the challenge. The challenge is as we try to understand the outcomes of human development, you know, how do we do it or are we trying to deliver an intervention? How do we do it? Do we think we have a program that works for everybody? And therefore, all we have to do is just implement it. And I hear that a lot in the circles where some of my colleagues like to tease me as someone whose office hasn't changed or what happened to you Kofi; you're always talking of context and I say context is very important.

So if my goal is to create a scientific database that allows us to understand what is common across our universe it's a very laudable goal. But it will also mean that we will have to be ignoring a lot of things that are very important but are localized. So localized that you cannot measure it in the same way across context. That's one of the biggest challenges for international comparisons right now, the way I see it. So every time somebody says, "well, but we cannot be just studying individual settings. We need to look at what cuts across." And I say, "by all means, let's do that. But just remember that by the time you isolate the things that you think you can compare across cultures, you've already dropped a lot of things that are very important but cannot be compared across context because they differ from one context to another. " So how do you balance it? I think there's a practical, commonsensical to balance it and even the international organizations like UNICEF, in some of the databases they are creating like the MICS are beginning to have what they call the more general kinds of questions and then questions that are designed in addition so that countries can determine whether they want to gather data on those questions that are very, very localized. When you do that you get the best of both worlds.

Marfo – perspectives on human development (2:32)

The issue of how we look at human development in general but in particular young children. It's one that has not been discussed a whole lot. Most scholars agree that there are multiple perspectives on anything. The question is does our knowledge base and does the literature reflect what we all seem to believe in. Knowledge, like many things, it's really context bound. I mean the things we care about, happen to be the things we know about and we know about them because we are a member of a group and we are located in a certain place. We are part of a particular culture. We've had a certain type of education. So everything we considered to be knowledge is actually bound in context. It is either a reflection of what others have passed on to us from within that society or what we have gained formally through reading research. And the idea or the ability of any of us to place ourselves in a different perspective is part of what makes you know conversations and ideas and dialogue rich.

So even the research questions we pose typically reflect questions we have on our minds. So we look at western research. Every research is problem solving. It's a problem solving system. And so our research hopefully begins from the questions that are important in the context in which we live our lives. So if you took a topic or a research question that somebody has found very compelling in Canada and so this is wonderful, I like the results let me go and try it in Machakos in Kenya. You're really missing a very important part of research. Now the idea of replicating to see if there are differences between the Canadian town and Machakos in Kenya is a wonderful thing. That's not the issue. You can always do that. But if you're trying to answer a question that society faces then that Canadian question may not be the question that's important for people in Machakos who try to understand. So that's in the general sense, that is why perspective matters because most of the things we do are driven by circumstances some of which are actually tied historically to places, to cultures, to ethnic groups and things like that.

Marfo – play and play materials (4:33)

So play is universal. It's not even just within the human race. It cuts across sort of phylum. And then there is, so what constitutes play? Ok, so if play is universal but what constitutes play can vary from one place to another. So when you bring the knowledge home to the practical kinds of things and you ask yourself what is the role of play in children's development of anything, their development of social skills, their development of cognition, the way they think, their development of specific forms of knowledge such as quantification, their ability to compare one thing to the other.

So we can think about broader stroke products of play. Children become smarter through play. They polish their language through play. They come to know their role in relation to another through play. There are all kinds of things that, the list can go on and on and on. So what do kids have to play with though, to get these outcomes? And that is where the issue is and I will contend that cultures around the world provide alternative pathways to optimal development. So if you're thinking of children's conceptual development, being able to understand that something this size is smaller than something that size or you can take two pieces of stick and you slide them this way, you arrange them in a way that they are not matching. They could actually be the same length. But children have to learn to know whether you have to map things out exactly that way to tell whether they are the same or not. So the question becomes if we want to take advantage of something that is so natural such as play, to design curriculum, to design pedagogy, how we go about sort of teaching. What are we going to do? Are we going to order toys from Toys R Us somewhere in Texas? What are we going to do? And the point is that actually the things that children play with that are responsible for the multitude of developmental competencies that they come across are all around us.

The only thing I would say is if you're going to be thinking about play, which I'm one of the supporters of play, as a natural way in which children learn. Then as you begin to formalize it, I mean you have play, free play where children you know, just the joy of playing, but the joy of playing itself is producing all these wonderful things. The task of promoting play as part of pedagogy and the task of using play as a medium, not just of instruction, as self-constructed learning requires some formality in the school setting where as a teacher or as a curriculum developer, I'm thinking of the outcomes that I want to have. And I'm saying to myself, what elements in the children's environment, that they are familiar with, can I bring together so that as they play with these things, the things that I know are likely to come out of it, you know, a, b, c, d, are coming out of it.

So play represents one of the, probably the most important areas where we can illustrate the importance of diverse ways of looking at the world. But also the importance of looking at play materials really as not tied to any sort of cultural or locational sort of group, that all the elements are there. To formalize them though, so if I were to work with a group of curriculum developers, I probably would start with what are some of the goals we want to accomplish instructionally? And you list all the things you want to accomplish and say well are there things we need in our environment we have in our environment that can actually help us, you know stimulate the kinds of learning that will produce these kinds of outcomes. Now that is the tough part that we are not doing because we are easily looking to

stores to find the things that we can buy. Unfortunately, when you go to store, the things you find to buy are not necessarily the things that children play with in their environment all the time.

Marmot – health gradients (2:02)

We see the gradient in health pretty well everywhere. I was talking with a group of researchers working in Sub-Saharan Africa, and one of them said to me “Oh, the gradient isn’t an effete concern of people in rich countries, where we’re working it’s the poorest of the poor , that’s the issue”. I said “If you found a group with an under five mortality, of 150 per thousand live births would you think that was worthy of your attention - 150 per thousand live births given that in the better off parts of Europe it’s three per thousand live births?” He said “yes”. Okay, that’s the middle quintile in Uganda.” In fact, the top quintile, the best off quintile in Uganda, oh sorry, that middle quintile in Uganda is worse than the bottom quintile in India.

If you focus only on the bottom, you miss most of the problem. The fact is, everyone in Uganda is at high risk. And we see the gradient in under-five-mortality in Uganda, and India, and Kyrgyzstan, and Peru, and everywhere we look. Now I’m quoting under-five-mortality because these data are readily available – they come from demographic and health surveys. We have fewer data on adult mortality, but from those countries where we do have data, those middle and low income countries on adult mortality, that too shows the gradient.

So what started as a finding in British civil servants is a really very general phenomenon. And that’s why it’s very much influenced the way that I’ve approached the policy issue which is that we have to take action across the whole of society.

Marmot – improving health outcomes (2:45)

What we know is there are remarkable examples of communities of relatively low income that have good health. So for example, one of the famous ones if you compare the state of Kerala in southern India with the rest of India – Kerala is one of the poorer states of India in terms of income – but there are two key characteristics of Kerala: one is that it has a high degree of gender equity, and second, they put a lot of emphasis on education.

We know that education of mothers is highly correlated with infant and child mortality – inversely: the more education of the mother, the lower the infant and child mortality. Now where education is related to better health, we could debate whether education is some marker of social position, or is it education by itself? Where education is related to lower infant and child mortality, you could see without too much difficulty, a plausible direct mechanism: mothers who are more educated, know about clean water and nutrition, and all those important things for children's well-being.

And it's a very interesting question. I was in Costa Rica recently, that's another famous example of a relatively poor country that has good health. They have very inadequate data on health inequalities in Cost Rica because it's not something they've really thought about very much, but despite having big income inequalities – like the rest of Latin America has – despite being relatively poor, they have remarkably good health. And one of the questions they ask themselves, in Costa Rica, is why.

And the first thing anybody says to me there is "We abolished the military in 1948. So we didn't spend money on military. What do you want a military for? To suppress your own citizens? And we spent the money on education and social protection and health care and clean water supplies." So it's a very interesting question of whether those things: education, social protection, clean water, actually protects from the deleterious effects of large income inequalities.

Marmot – social determinants (2:52)

My view, based on my own lifetime of research, and the compilation of evidence from other people's research, is if you look at what has happened to health in different countries over time, the key determinants of the improvement in health have been the social determinants. Societies get healthier in general when they develop. When they have no military, and good education, early child development, gender equity, good employment and working conditions, get rid of the slums and so on. These are all very important. It doesn't mean health systems are unimportant, they're key as well.

But this big picture of saying that health is a result of development, and development, not just economic growth, but broader social development, this big picture is absolutely vital because otherwise, it's in a way accepting "Well people are going to get sick for whatever reason and we'd better make sure we've got health care systems in place to deal with it when they get sick" without actually looking at the circumstances of people's lives that lead to that sickness. When we began the commission we said "What's the point of treating people when they get sick and then sending them back to the conditions that made them sick in the first place?"

"Shouldn't we both treat them, and try and improve the conditions so that the likelihood of getting ill in the first place is lessened?" Now, with the global commission, we were dealing with Sub-Saharan Africa, and Latin America, and South Asia, and North America and Europe and so on. It's very difficult to have one set of recommendations that apply to all those different countries.

That means first, presumably accepting the general orientation and the general findings of the commission but then for example, what we did in the UK, the British government invited me to conduct a review of what the commission's findings meant for one country. And we did a report, we convened nine task groups to re-review the evidence, and for example, coming back to early child development, what our task group on early child development and education said, "if you want to reduce inequalities in early child development and education, you have to reduce inequalities in society". I think that's a key message.

Marmot - Whitehall study (2:14)

The thing about the Whitehall study of British civil servants, Whitehall and Whitehall II, the two studies we've done, is it excludes the richest people in society, and it excludes the poorest people in society, and Britain of course on a world scale is a very rich society. And yet we've found this remarkable social gradient. And that's when I coined the term "social gradient in health". So people second from the top who have university educations, stable jobs, reasonable housing, reasonable salaries, good job prospects for the future, have worse health than those above them. And so it is, all the way down in the social hierarchy.

And when we first found that, in the Whitehall Studies, people said "well there's something odd about civil servants". But in fact, everywhere we look in the national figures in Britain, and now, I've been sitting through a conference on early child development where people were presenting data from Canada, from Chile, from Australia, from Cuba, from elsewhere – other parts of Latin America, everywhere you look, you find this gradient.

And the implications of the gradient are quite profound. Everybody's against poverty. They may not want to do anything about it but everybody knows poverty's a bad thing, and conceptually, it doesn't sound very complicated, poverty? Well people don't have enough money, and they don't have housing, and in the developing world they don't have clean water of sufficient food or shelter – fix it and health will improve. And so it will. But the gradient means that we've got to deal not only with the poorest of the poor, but people in the middle who have worse health than those above. The gradient means we're all involved. And that means that action's got to be across the whole of society, not simply, as if it were simple, the poorest of the poor.

Marmot - WHO recommendations (3:01)

The starting position in the WHO Report of the Commission on the Social Determinants of Health, is put social justice at the centre. We said social injustice is killing on a grand scale; that a toxic combination of poor social policies and programmes, unfair economics, and bad politics is responsible for most of the health inequities that we see. So, if you like, the central recommendation is put those things right. Put social justice at the core, and address this toxic combination of poor social policies and programmes, unfair economics, and bad politics. For some reason bad politicians don't particularly want to address bad politics and so that's complicated.

But one of the messages we learned while we were doing the global commission is, if the politicians won't take action, then you need social movements. And we said this in our report: that all social advances have come from social movements, whether it's universal suffrage –the right to vote, gender equality, the trade-union movement that improved conditions in working places, I think health equity and the social determinants of health will need a social movement.

Now that's great, at least I think it is, but what does it mean in practice? We then had three key sets of recommendations. The first was on the conditions of daily life: the circumstance in which people are born, grow, live, work and age, and that includes early child development, it includes where people live, it includes employment and working conditions, health systems, and so on. The second was in the structural drivers of those conditions of daily life. Putting health equity into policies. Gender equity. Fair financing. Market responsibility. A fair globalization. So dealing with the structural drivers.

And the third area of recommendations related to the importance of monitoring, of training, having a work force of research, so the importance of knowledge, people of understanding. But the central issue of social justice at the centre, I think, must not be forgotten. And then you need to take practical steps to implement it.

Marvin – circle of repair (9:08)

Having a toddler can be a real challenge, and I think maybe the one that strikes me as being the biggest challenge for the largest number of parents, is what you might call a "toddler meltdown", or a temper tantrum, or, but meltdown is a better, I think a better term. And so often when, when a child has a meltdown, the kinds of advice that parents get from their pediatrician, from the child's preschool teacher or day care provider, from lots of different places, lots of professionals, the advice that parents get is, "Well, you need to manage that. You need to get him to stop that. And the way to do it is time him out."

A time-out is based on the idea of making the child go off by himself and sit there until he can calm himself down and then he can come back and rejoin the family, or rejoin the activity. Now if the child is doing this thing absolutely on purpose, then that's certainly appropriate. But we estimate that toddlers are doing this on purpose maybe only one time out of, one or two times out of 10. Maybe only 10 or 15 or 20% of the time. The vast majority of the time, the toddler is not doing this meltdown on purpose but rather there's something else that happens. What we realize is that meltdowns, most of the time, happen because a child, a toddler wants to do something, or he wants something, and he's being frustrated, maybe it's because he can't climb up that slide. Or maybe it's that he wants to play with his sister's toy, or play with something dangerous and the parents says, "No, no, you need to share", or "No, no, you're going to get hurt with that, you can't play with it." And so the child has a meltdown.

And what we know now, is that what's really going on there is again, this child is not very wise yet--he's only a little toddler—when he's frustrated, he has the same kind of feeling that all of us have. This feeling that kind of wells up in us and it's like "Awww" kind of feeling. Well as adults, we've learned how to manage that feeling. We've learned how to cope with that situation. The problem is, for the toddler, he's still a little, little kid and he hasn't developed a strategy yet for doing that.

And we have another graphic that we use that we call the "Circle of Repair". And on that circle of repair is the same circle with the hands represented by the parents, and in addition to that, over on the right hand side, there's this little kid with his arms up. And he's saying, "Mom, when I get difficult, when I get frustrated, demanding, upset, out of control, what's really going on, what's really going on is not that I'm trying to hurt you, or that I'm trying to be bad, or anything like that. What's really going on is, I'm having this feeling that is really uncomfortable for me, that I hate, that, that I don't know what to do with and that's the most important part. I'm having this feeling and I don't know what to do with it. And I need you."

And there are a number of steps that sort of become the parent's job in this situation and these steps need to be taken in this order. First of all, to understand, that your toddler's behaviour, this out of control, meltdown behaviour, actually means that he needs you to do a number of things and he needs you to do them in this order.

First of all, he needs you to take charge. He's out of control and when little kids are out of control, they need their parents to take charge. "Be bigger than me. Be stronger and wiser than me. Mom or dad, you need to take control first of all and get things under control." Second thing is, don't take it personally. "Please don't take it personally mom. I'm not, this signal that I'm sending, is not a signal that says to you, 'I don't like you, I don't need you, I don't want you, I hate you'. Even if I say 'I hate you', I don't."

The third thing is try and help, "you need to try and figure out, mom, what's wrong here. What do I need as the toddler? What do I need and what do you need to do? What's going on with me? I'm too young to be able to figure it out." So that's your job. Is to figure out "What's going on with my child?" And the rule here is, we often tend to, to make an inference. We often tend to think, "Oh, this is what my kid is doing". And it's usually what we call a negative inference. "My kid is doing this to bug me. My kid is doing this because he's angry with me. He hates me. Some negative thing about me."

And the rule here is, be kind in the inference you make, be kind in the inference you make. Don't make a negative inference. For these 80% of the time, sometimes negative inference is going to be appropriate but probably only 20% of the time. "Eighty percent of the time you need to make a kind inference about what's going on about me." Once you've made that inference and figured out, then the job is, "Soothe me. Try to calm me down. In a kind way. Understanding I don't know what to do, I'm out of control and I need you to take me in and contain me and help me feel better and soothe me."

And then, the next thing is, "Stay with me until we both understand what's too much for me to understand all alone here. Stay with me with this." Now, if I'm three, four, five-years-old, then I'm already at the point where you can talk to me about it and we can have a conversation about this. Most of the time with toddlers though, language hasn't developed enough and so it's really a matter of, "Staying with me and holding me and giving me the message, 'It's okay, it's going to be okay, I'm working on figuring out what's going on inside you honey'".

And then finally when you've got that figured out, mom, then help me to do what I was trying to do, but do it differently. And help me learn how to contain myself, and help me learn how to manage those awful feelings that I've been having. And just by being with me and holding me, or holding my hand, or sitting next to me or something like that is going to help me learn how to contain them."

Now this comes back again, all the way back, to this notion of time-out. What this approach is is more like a "timein". It's not really a time-out. It's more like a time-in. "My child is out of control, he's hurting. He's having a feeling that's really uncomfortable and he doesn't know how to deal with it. So my reaction should be, "Come here honey, let me help you". That's the first thing. And soothe him down. Calm him down, and then help him. So if you're going to tell your child what he should have done instead, wait until he's calm because he's not going to be able to learn if he's all upset and still on the meltdown. He's not going to hear what you're saying. So calm him down, help soothe him, then help him figure out what to do next time that will be more successful

Marvin - circle of security (5:51)

Well, the Circle of Security is a, we think of it as a user-friendly version of a very complex theory that's been developed and set of research projects over the last 50 years and it's in the general area of attachment; the attachments that babies and children develop toward their parents, toward their caregivers. And so we developed this framework, this simplification of the theory that we call "The Circle of Security". And it is really both a way of thinking about children's relationships with their parents, thinking about attachment, and it's also been used to refer to an intervention that we've developed to help parents who are being challenged by their kid's behaviour.

We use the, a graphic that we've developed where, on the graphic, is a circle, it's an oblong circle, and there's a set of hands on the left hand side of the circle. And those hands refer to the parent. They represent the parent. And you'll see that on the top side of the circle, next to the hands, is the term "secure base". And on the bottom side of the circle, next to the hands, is the term "safe haven". Well, what we're trying to get across here is that children use their parents as a secure base for going off and exploring the world. And we think about that as moving away from the hands, moving away from the parents as a secure base. And at other times the child comes back to the parent on the bottom of the circle, using the parent as a safe haven. And let's take those one-at-a-time. When the child is exploring, he moves, he or she, moves off away from the parent to explore, and is moving away and either exploring a new place, or interacting with somebody who's new to them and so sort of exploring a new person and developing a new relationship perhaps. And to do that, a child, in some ways, moves away from the parent to be able to do that. A lot of times, what we as parents think is, "Oh, my child is off exploring. He doesn't need me right now". But in fact, that's not the case. The parent, the child needs the parent when the child is moving off to explore, in some very important ways. And in fact, the parent has a number of jobs to do while her child is off exploring. And on the far right of the graphic, you'll see this box with four bulleted thoughts, what we think are the four most important jobs that a parent has when the child is exploring. First of all, there's the job of "Watch over me. Monitor me for safety. I am just a little kid and I am off exploring and my ability to move away from you and get in trouble is a lot more advanced than my wisdom" so to speak. "And so I need you, mom, or dad, to watch over me and monitor me for safety."

The second thing is, "I need you to delight in me, in what I'm doing". And that's something that a lot of people, even researchers haven't paid really enough attention to the notion that the child looks back at the parent when he's off exploring, or she's off exploring, and looks for a smile, a moment of delight from the parent that tells the child, sends the child a signal, "I'm here, and I'm with you, and I think you're the greatest thing since sliced bread, and if something bad happens, I'll be here to help". So the second thing is delight.

The third thing is, "Help me. Sometimes I'm off playing and doing something and I'm doing a pretty good job but then I get challenged and I get stumped, and stuck, and I can't do what I'm trying to do". In those cases, the child hopefully sends a signal to the parent that, "I need you. I need you to help me". And the idea here is it's the parent's job to help the child, but not do it for him. Not be intrusive. To help him get over that little hump that he's experienced; that

little difficulty that he's experienced, so that he can go on and finish whatever he was doing on his own. And we think of that as "scaffolding". That what the parent does, is do just enough to keep the child engaged in the activity, and keep the child experiencing success.

Then the fourth one is, "Sometimes I just want you to play with me. Sometimes just enjoy with me. Be my playmate". That's a very important part of being a parent. And if the parent can do those four things, then, then, that's good enough parenting. That child is going to be developing a real interest in exploring, he's going to feel good about himself as he's learning, he's going to develop well, and he's going to be secure when he's exploring on top of the circle

Marvin - responding to children (4:01)

The next thing though, is that, invariably, while the child is out exploring, there are going to be times when the child is either hurt, or doesn't feel good, or is hungry, or is scared, or something. And that, those things, that when the child is feeling those things, boy does that ever stop the exploration. And what it does is that it, it activates the child's attachment behaviour, the child stops exploring, and he needs to go back to the parent as a haven of safety. And when that happens, we talk about the child as being on the bottom of the circle. Needing to go back, needing to be welcomed back to the parent

First of all, the first job is, of course, "Protect me. If I'm scared or if I'm hurt or if I'm sick" or something like that. A parent needs to protect the child from the danger. In addition, of course, as parents, we all know that there's another kind of protection that we do, we protect the child from getting in trouble himself. So we're, in a sense we're protecting the child from himself because again, he doesn't have the wisdom yet, and so the parent has to provide that wisdom. So the first job then, when the child's on the bottom of the circle, is for the parent to welcome the child in--and some of us have a hard time doing that sometimes—but to welcome the child in and first of all protect him, and then if the child is upset, to comfort him, to soothe him, or sometimes kids just need to come back for a quick recharge.

The next job is, again, "Delight in me". And the parent's job is, one of the parent's important jobs is, even if your child is upset and coming to you with some need that he has, for you to delight in your child, and indicate to your child, "It's fine for you to come to me when you're feeling this way", and "I love being your parent", then that is really going to be helpful in the child's development.

And then the final one is, "Help me organize my feelings". That's what we have on the graphic. What we really mean here is, "Help me organize my behaviour" and "Help me organize my feelings". Well we all think about behaviour management, and discipline and making sure that our child is behaving appropriately, what a lot of us tend not to think about is "Help me organize my feelings". Because little kids, especially toddlers, little kids have a lot of very, very strong feelings, but they haven't, they're still very young, they haven't yet developed strategies for regulating those feelings from managing those feelings, for dealing with them and coping with them. So we think about the circle as representing the child's daily life. And he goes around the circle hundreds of times every day. And we know that if a child and parent can, can navigate that circle well, that most of the time, things go well when the child's on top of the circle, on the bottom of the circle, and the child's doing his or her job and the parent's doing his or her job, that that child is going to be secure. That child is going to have a secure attachment. And we know that secure attachment, if a child has a secure attachment, then that hugely increases the likelihood that that child is going to develop along a good developmental pathway.

Marvin - supporting children (4:11)

Very often I get asked, by people who have seen this circle of security graphic, that they're a bit confused about this thing down here at the bottom that says, "Always be bigger, stronger, or wiser and kinder". It's easy to think about, it's easy to understand that a parent's job is to be wiser and kind. Sometimes it's a little more confusing to think about the parent's job also as being bigger and stronger. And it's just because the child is, is still vulnerable, is still developing, could get in trouble, doesn't yet have the kind of wisdom that he's going to have when he's an adult, and so, in order to stay protected, in order to survive, children are actually wired to want a parent who is bigger and stronger. And they look for that in a parent. But bigger and stronger doesn't necessarily mean "mean". It doesn't mean nasty. It doesn't mean angry. Bigger and stronger means that the child gets this message, "If something goes wrong, I'm big enough and I'm strong enough to take care of you, and take care of it". And that's what children really want. But most important here is that, there are those four things: bigger, stronger, wiser, and kind. And the really important thing is to have all four. And to have some balance in all four. Because if you are bigger and stronger, but you're not kind, then you're going to come across as intimidating, scary, and angry. If you are wiser and kind, but you're not bigger and stronger, your child's not going to feel safe because if something happens, "There's nobody there for me who's big enough and strong enough to take care of it. So you do need all four, but you need to keep them in balance with one another.

And the thing is, it's all these little moments, sometimes we think, sometimes we think that it's the big things. Does the child, is the child in a good preschool? Is the child in a good school? Period. Does the child have lots of friends? That those big ticket items, so to speak, are the really important ones. And it turns out, that what this research is showing is that, that's not so true. It's all those little moments, on a minute-to-minute, hour-to-hour, day-to-day basis that really are the things that put a child on a good developmental pathway, and keep him on that good developmental pathway. So these little moments are really, really important for parents to pay attention to. And these little moments are actually more important than the really big things.

But it doesn't mean we have to be perfect. It doesn't mean that at all. You don't have to be successful at this 100% of the time. So as parents, we can relax a little bit. No one knows the exact percentage but just to give you an idea, maybe 75% of the time. Just really so long as it's predictable to the child that this is the way it's going to work, but it doesn't have to be 100% of the time

Masten – individual differences (2:04)

Some people, you know, they can go through all kinds of experiences and they just react less to them. They have a less reactive system. No two people have the same experience for lots of different reasons. Not only are people more and less sensitive, but people of different ages have different tools, people have different talents and skills for coping with emotional and challenges and physical challenges.

And most importantly, people have different relationships in their lives. And it's our connections to other people, other people in our family, our caregiver, our friends, and as we get older, people in formal organizations. Maybe people on our team, people at school, our teachers, our church leaders, or others in our community provide a lot of resources to help us deal with adversity. So, often it looks as if some people just can do it on their own, but that's not really true. You know, as the younger you are certainly, the more true it is that you're completely depending on lots of other people and resources. But all of us depend on many other people and resources out there in the world in order for us to withstand and recover from severely challenging adversities. We develop that way, we evolve that way. Both in terms of our biology and in terms of our culture. We are part, we are interconnected to all the systems around us, and the capacity we have to respond well to challenges, or to recover when they're completely overwhelming.

Masten – interrelated protective systems (3:08)

Well protective systems can, you know are interrelated and go across many levels of human life. So a child is protected by a family and a family, families in the community are protected by many other systems in the community that provide crisis help or fire and rescue and help in a disaster you know. Many times you can see how people come in a try to help at a community level when there's been a threat to many families all at the same time. So there are many levels of protective systems and children interact with many different systems in their everyday life, so it's important for them to have protections in the family, but there are also protections at school, protections in their friendships with other children, in their connections to neighbours and community resources, and there even protections at the level of society that help children and families through policies that a nation may have to help, through culture, cultural traditions and religions that have ways of providing support both to individuals and to families and communities in times of trouble. And you realize how interconnected all these systems are when you have a major disaster that disrupts them all at the same time, then you realize it takes a long time to recover when all systems are harmed at the same time, or break down at the same time.

I think that cultures as well as religions have developed many specifics ways of helping individuals and families through rituals and traditions that provide support in times of transition or in times of trouble. In human life, people have happy transitions like marriage and birth and they also have very serious, difficult transitions such as loss of a spouse, loss of a child, and that kind of thing and cultures can provide a lot of support in a very concrete way with ceremonies and bringing over food and keeping you company, but also cultures and religions provide the solace of meditation and prayer and relationships with spiritual figures, these are all forms of protective practices that have been sustained over generations, because they work to help people, and they're a very important part of the protective systems for families and individuals in communities.

Masten – protective systems (2:55)

What we've learned from many kinds of research about children who are okay in the context of serious threats is there's some very basic protective systems, they protect human development from many different kinds of circumstances and those are things like having a capable adult, caregiver, looking after you, having a human brain in good working order that can solve problems and that is a brain that's been well nourished and had opportunities to learn so that the child can respond well to the environment around them. It also includes the motivation to you know, try, to connect with people to, you know, try to do things and make things happen in the world, so it's very fundamental protective systems. The most though for young children is, adults, adults who are connected to the child, secure relationships with caregivers and many other people in a child's life because that gives them the emotional security to withstand adversity, and also the protection of an adult who has better problem solving skills and capabilities than a young child would, and can see what to do in a threatening situation.

I use the term ordinary magic to describe the fundamental protective systems for human development, to underscore the idea that we're, it doesn't take anything rare or special to help children withstand or recover from adversity, it requires these fundamental protections like close relationships with capable adults who are helping you and, you know, good problem solving skills and optimism and hope and trust in the future. If these are working, these fundamental systems, which have evolved through millennia you know, in our culture and in our biology, then children have great capacity to recover from and get through very difficult times. The biggest threats to children happen when these fundamental systems are damaged or destroyed and getting them back on line, providing them to children, are very high priorities. A child will have great difficulty making it if they don't have that protective adult in their life, maybe because the adult has been lost, or, or killed or harmed in some way by the same adversity threatening the child.

Masten – protective vs. promotive factors (4:25)

The most important distinction between a promotive and a protective factor is the idea that promotive factors are helpful for development or good for whatever outcome you're interested in under any conditions, so good parents are great for children no matter how much adversity they have in their lives, they play many roles in ordinary human development. Protective factors refer to the factors that make a difference under very high-risk conditions so they, they provide special support or special role when there's a threat, a significant threat in place. And usually people are making the distinction that under very high-risk conditions parents for example may take different kinds of action than they do in under every day circumstances. So parents could be both, they can be promotive, cause it's always good to have an effective parent in your life for development, but under very threatening circumstances parents may spring into action and provide, you know, a different kind of support, a different kind of protection to their children ranging from you know, jumping in front of you know, an attacking dog, to intervening to make, you know help their child avoid a threatening situation that maybe does not need to be have to be dealt with, parents can monitor how much exposure children have to horrible things that are happening outside in the world or on television, through the media. So, you know it's been an important distinction, and I think it's an important one to make, that some things work under all conditions, and other kinds of protections have a special role to play when things are very difficult.

Well one of the things that I've learned from all of my own research on resilience, but also the larger body of work on resilience, because by this point, after the four waves, there's a lot of findings on resilience in young people and adults, and a lot of that work points to the same list of protective factors, and I've started calling that the short list. And what the short list is, is a list of the most commonly observed protective factors in studies of resilience, and that list includes things like: good problem solving skills, close relationships with competent and caring adults, the motivation and confidence to try to respond when you're going through difficulties, faith, hope, belief in yourself – there's many things on that short list but these, the short list really means that there are some fundamental, protective systems that have evolved over many generations and probably thousands in both human evolution, biological evolution, and also in our cultures. I think what the short list means is that we have some tools for resilience that are part of our human legacy, and they're very important for helping us adapt under many different circumstances and the biggest threat in the lives of children, or adults, is when these important tools for resilience are harmed or shut down, or destroyed by maybe the adversity that is occurring. And keeping them going, restoring them, is an extremely important priority to promote resilience in the context of disasters or any other kind of adversity.

Masten – resilience (2:25)

My work is long been focused on trying to understand what makes a difference for children who are coming out of really tough backgrounds, to help them grow up to be very successful young people and adults, and our work keeps confirming a very familiar set of protective factors. So I'm interesting in understanding, what are the key protections for children, how do they work at different ages, and what can we do to promote more resilience out there? And we've learned that there's three basic strategies. You need to prevent or reduce the exposure to risky situations, we can't always do that, so the second strategy is to provide the kind of resources or mobilize the protective systems we all have out there. So they work for children to protect them as they go through adversity, or as they recover. What we've learned is that some of our most vulnerable children are the children where we have the greatest opportunity to make a difference for them. And science from different areas of the world about children on the margins, either due to discrimination, due to you know, migration and acculturation, that those children have so few resources and so many burdens on them, that if we lighten the burdens and provide adequate resources and hope for the future, both they and their families often respond with a really striking recovery. As the conditions for child development improve, you really see the power of resilience. Nothing fancy, just ordinary opportunities, ordinary resources, and people around communities around children in their families that are trying to support healthy development, and bringing those children into the mainstream of society, into opportunity.

Masten - resilience and self-regulation (5:16)

Promoting resilience in early development is extremely important because you are laying the groundwork for the future. We know that, you know, competence begets competence, and that's partly because as you go along in development you know, the skills you learn and acquire in one period of development provide you with the tools to tackle the next set of tasks in front of you. The other aspect to this is that many of the fundamental systems that have been implicated in resilience have formative years, early in childhood, so that the learning and developing the capabilities for executive function or self-regulation skills of many different kinds, all those, you know, self-control, to be able to listen, to be able to control your attention, to regulate your emotions, a lot the groundwork in terms of socialization and brain development happens in the very early years of life. So, you're building both a set of skills to take the next step, you know, you're learning to walk before you learn to run, but you're also developing in very important ways and learning from interacting with your environment, most importantly the people who are close to you, your caregivers in your environment, and also through play and exploration you are developing a lot of the fundamental tools and protective systems that appear to be the engines for resilience in later life. So, I think you have both happening, and that's why investment in early years is so important for life-long resilience. It doesn't mean that you can't develop resilience tools later, it just may be more difficult.

A lot of evidence, over the years, has pointed to the importance of self-regulation in many different forms for resilience, being able control your temper, as well as your attention, to be able to make yourself do something even when you don't want to, or stop yourself from doing something, even when you do want to, so both inhibitory control and getting up, you know, the self-discipline to do something, like study for that exam, or whatever, even when you don't want to, these are all extremely important when you're faced with challenges, and I don't think it's surprising that they're so commonly implicated in the study of resilience. You know, it helps with your problem solving to be able to wait, and evaluate what is happening in certain situations, however if a tiger is after you, you've got to, you know, respond quickly, and get going. So, you know, these systems enable you to deploy your adaptive capacity effectively depending on the situation, and young children are just learning self-regulation skills, so they have a back-up system, which is a parent, with good self-regulation skills, so you have an external regulator in the parent that acts on behalf of the child, or tells them what to do, if a child, you know, is unable to make decisions effectively, wait when they should wait, avoid dangerous situations and so forth, and one of the most important jobs of a parent is both to regulate, to be watching out for the child and helping them do what they should be doing, but also the process of interacting with the child, you know, in a loving, organized way, helps the child learn self-regulation skills, and fosters the brain development and systems that will eventually make it possible for a child to monitor their own attention, behaviour and so forth, and really put together a response, as they get older, that is adaptive, planful, you know, the right choice at the right time. A lot of what happens in the middle of danger or adversity has to do with good decision making, about what to pay attention to, what to do and so forth. And these skills are extremely important process, part of the process of adapting to threatening situations and recovering from them.

Masten – study of resilience 1 (3:28)

The scientific study of resilience got underway around 1970, plus or minus a few years, so it, you know, really grew out of the study of risk, people who were trying to understand the origins of mental health problems, but when they started studying children at risk, they began to realize that there were a lot of children and families who were doing better than they expected, and people got intrigued with studying the phenomenon of resilience, and since that time there have been four waves of research, and science, the first wave typical of an emerging area was descriptive, you know, what is resilience, who is doing well and who isn't, what makes a difference, what are the promotive or protective factors that seem to make a difference.

And then as people began to get an idea of what those factors were, they wanted to understand how they work because the ultimate goal is to try to intervene to promote resilience and in order to do that effectively, you need to know how the processes leading to resilience actually work. So people began to do more studies of processes. The first wave gave people an idea of, you know, what makes the difference such as, you know, good cognitive skills, good parenting and so forth, and in the second wave, they tried to really focus on what are parents doing that helps their children in this kind of a situation, because maybe if we could teach or help other parents do this, for their children in a similar situation, we could promote resilience, in a family.

And so there was a lot of research, and that's still underway, on how resilience works, the 'how' question. And then, as people gained confidence that they understood some of these processes, they were willing to try them out in a design where you could intervene and do an experiment and see if we try to put this protective process into place, mobilize these protections, try to help children, does it work the way we think it will, if we try to change and support parents for example during an economic crisis so that they can be a more effective parents even though they're struggling, do we see better outcomes in the children. And the research supported a lot of these ideas; there were some great research with experimental designs, prevention and intervention research that strongly corroborated theories of change about resilience, that in fact if you do help children with their cognitive skills or help parents with their parenting skills that you see a positive change in how the children are doing under very difficult circumstances, so that wave also is still unfolding over time,

Masten – study of resilience 2 (4:04)

And then the fourth wave is kind of a tidal wave, because the fourth wave has been, is occurring because we've had all these advances in technologies for studying how the brain works, how biology works, how genetic work, and also the kind of statistical methods, you know that able us to study the complex dynamics that are involved in the study of resilience, and what's happening is a rapid transformation in the research where you have an interest in what might be called multiple levels of process where you try to understand, you know, what's going on when you have one of these protective processes, how does good parenting get into the child, into the functioning- the biology, the neurology, of this child, what happens between a parent saying or doing something and a child's immune system working better in the context of adversity.

So there's a lot of interest in linking what's going on from a very molecular level, where people study processes of genetics and epigenetics, to a neural level, where people are trying to understand well, how do protective systems like cognitions or self-control actually work in there- can we observe it through brain imaging or other kinds of techniques, and how is that related to the behaviour then that we see as we observe resilience in a child. And there's increasing interest in the interactions, the dynamics of how people interact with each other and how that works to promote resilience.

So it isn't just all in the organism, there are people who are very, very interested in how people interact in families, how children interact in peer groups that promotes, or doesn't, resilience in individuals, so I think we're going to see a lot of new work trying to link across these levels, and that's going to take collaboration because people are complicated, and their lives are complicated and it's hard to have the expertise on more than maybe one or two levels, and so what we're seeing is multiple disciplines getting together to understand across levels how resilience works and some of these levels are very large systems.

So people who study disasters for example, want to know not just how resilience works at an individual or family level, but can we link it to the functioning of a large area effected by disaster, how are humans interacting with ecosystems in resilience across the planet? So, there's a lot of integrative work going on, and people are trying to, you know, integrate their theories and ideas about resilience. When I define resilience now, I try and keep in mind that I want to be able to communicate with people from other disciplines, so I might say, you know, resilience refers to the capacity of a dynamic system to withstand or recover from serious threats and disturbances to that system. That kind of definition could be used by somebody at a molecular level, or by somebody who studies ecosystems, and I think that's a very important part of this new wave.

Mjaka – learning through play (0:53)

It's important, because you see the learning of the child is through play. Children learn best through play. So we are saying that everything that can be initiated from teachers should start with play. They play together, they have the learning experiences within themselves, they are supporting each other, but we are saying that play is very important to the learning of the young children. Because through play children can innovate new ideas, through themselves and others can innovate new ideas from teachers and through adult support.

Morris – smoking and the placenta (1:23)

Basically by end of term you have about 500 mL flowing through that placenta per minute so it's a huge amount of blood flow. And then the baby, the oxygen exchange occurs at that interface with the mom and the placenta and off to the baby. So when you restrict placental function by restricting the size of the blood vessels, you reduce the oxygen supply to the baby and you're also reducing the nutrient supply. So when you get enough of that interrupted flow, you will get a baby that's not growing as well as it should.

The commonest factor in poorly functioning placentas is actually smoking. The smoking is associated with a higher preterm birth rate. And the way we describe it to our patients is if this was your blood vessel before the cigarette, this is your blood vessel after the cigarette. It does interfere with placental function and it will increase your risk of having a small for gestational age or a preterm labour.

Mtana – inclusive programmes (2:35)

One of the things that we found is that especially in Mombasa – and this goes back again to the issue about investing in the child holistically – we realise that especially the curriculum that we have in Kenya that has been described by both those who are for it and its critics, agree on one thing: that it is rigid. And its rigidity is not just a function of the fact that it tends to focus on the average child, but that its rigidity is also around the lack of inclusivity in terms of realising that every child is unique, and making room for that special space that every child needs to have.

Now the cultural biases in the county of Mombasa, again around children who have special needs, is also a very strong one. With there being no assessment frameworks at early childhood, it's difficult for the average parent in Mombasa to actually, you know, have support from a school or from a centre, and told that, you know, your child may have either mild dyslexia or may have vision – may not be able to hear – may hear, but may not actually hear very well. But the fact that the child is in a room where – in a room of about fifty children and that child just happens to be sitting at the back of the room, and the learning ability may not necessarily be then clear for that child.

Teachers are not picking that up, and so we realise that there's a way in which we have to figure out how do we ensure that our schools are inclusive. And this is a difficult challenge that we recognise, especially because again, it was siloed. We have what they call the resource centres that are available in the communities, but again, haven't been resourced. So it's been a resource challenge: how do we mobilise action around special needs? Now the resource to be able to do that, I'm realising, is in itself an investment in terms of the practitioners that we need to have, but having said that, government needs to make that initial investment. But again, if we can make the right investment, then later on the investment actually reduces.

Mtana – investing (1:35)

The early childhood development is a phase that we know is foundational; we know that it is primary, particularly in terms of children's ability to learn language, to be able to see patterns, to be able to have confidence.

From a cost perspective, we were realising that we have – we're spending more money at our later years in our basic education, than most of the jurisdictions were. We were also finding that we had less students in our schools, and the challenge we have there is simply because fewer and fewer children were actually making it through the transition window.

And so we began to realise that there's something wrong somewhere. And then we began to look at the evidence, and it was evident that you look at the role that early childhood played in Mombasa, was largely in the hands of the domestic household. So you found that parents were keeping their children later. Many of the children weren't engaged in structured early childhood development, whether it be through play, or whether it just be through classroom or engagement. There wasn't really a strategic approach to it. So for us, we realised that it's important we invest in early childhood development.

Mtana – multi-sector approach (3:58)

The subject of a multi-sector approach is one that, right from the strategic objective of the county, we realised that we can't afford to silo the engagement around the child. When we took office in 2013 we realised that the Department of Health was doing their thing, the Department of Environment was doing their thing, the Department of Transport was trying to figure out, you know where is the space for the child in all of this?

And we realised that if we're going to race towards dignified care for every child in Mombasa, which was our vision, then we needed to collapse the silos. And so what we essentially began to do was to have multi-sector conversations around the child, by primarily realising that our mission here is family-focused and child-centred.

It starts from our strategic objective, where we're looking to ensure that we have a multi-sector approach, and then now beginning to actively have those conversations in the department, and allowed us to then have what we now have as an institutional framework that is called the Safer Cities Authority.

That allows us now to put in place regulations that ensure that the child's safety and care is taken care of within every space, and we've primarily seen a couple of spaces that are critical for us. Number one is the home. We realise that the child's primary facility is actually not even the school, it's actually the home.

And then from there, the child then finds their way into one of two other spaces: they'll either find themselves in a learning space, whether at pre-primary, or they'll find themselves in a faith-based space, where either Muslim or Christian or Hindu have some kind of learning or childcare environment. And so those became other spaces that we are particularly now interested in understanding what is going on there, what level of support, what level of teaching is actually taking place.

Most importantly then, we have the spaces of leisure, and I think this for us primarily being a resort city, then became another space that we needed to make sure that whatever is going on in that industry, is also building the child.
Then we realised, because of the geographical location and the planning that has taken place in the county, we realise that especially around care, children who are travelling across cities, either in search of religious support, or learning support, so we realised that the transport system was a critical space that the child – we needed to figure out what's going on there.

And then the health space-health right from birth, we realised that one of the things that we lost in terms of early childhood development-looking at early childhood development from birth to a period of about eight years-after around twenty four months we lost record of any development beyond the vaccination the child actually receives. Yet the child then reappears at about the age of eight years and we're not sure what the development has been like in between.

So part of that then required us to take a multi-sector approach to ensure that all of this comes together. And that's why we took the geographical structure as the best fit to execute the functions of care, education and environment.

Mustard - nutrition stimulation (1:33)

One of the questions that is raised in the developing world is, of course, sickness in very early period is dangerous. A lot of kids die from malnutrition, poor water supplies and infections. That is true. In countries, developing countries that have improved nutrition and provide safer water supply, you still don't get optimum development. You only get optimum development if you provide optimum experience or stimulation and that has been classically done in the Jamaican studies. It's interesting in the Jamaican studies, the effect is most prolonged is the actual improved experience stimulation part of the package, more so than the improved nutrition. Obviously nutrition and water supplies get you through the early years of life, that's important. But if you get through that and you've had inadequate stimulation you will not get up to levels of performance that you would ideally like to be at. So, do them together.

If you think about this, nutrition and water are important. They indirectly get under the skin because you ingest them and that goes through your body. But the experience that the brain receives during that same period is equally as important in terms of optimum development and so that you have to think in that integrated manner. So when you're feeding an infant, breastfeeding it, you're providing nutrition, but you're also holding it you're stimulating the brain development, you're affecting attachment etc. So dealing with this integrated system is crucial, even in developed worlds, by the way, not just developing worlds.

Mustard – mothers and others (4:12)

The question of support for mothers and their family structures goes back to Hrdy's book: Mothers and Others, in which she tries to give the history of the human species over the last 200 thousand years. Recognize that the human infant is the most vulnerable of the newborns of the mammalian species, and therefore it needs enormous support to develop effectively. That means, therefore, that if you're looking at your society, what are the mothers and others really like? Well in the hunter and gatherer societies, the male went off, males went off hunting, and the mothers collectively ran their community in which they were raising children etc. so the mothers had other mothers and others in the community that helped look after each other, and that's probably one of the reasons we've survived from that period of development.

And so there was a natural "mothers and others" network there, males of course, did their thing, but they weren't around a lot and perhaps they were just sleeping most of the time when they came back into the cluster. When you move to the agricultural society, ten thousand years ago, farming families needed children to be able to farm effectively, we didn't have a lot of machinery, and those nuclear families, the mother was the master of the household: she mastered the early child development, the children learned to work with the farm to work in the gardens, but in addition she would have had the support of all the relatives – the aunts and uncles etc. that were in the area because people didn't move around very much. And so that was a different kind of mothers and others format.

When you come to the industrial revolution, we became more urbanized as populations and perhaps didn't have as good "mothers and others" units, but we did a couple of very important things. We realized that people should have clean water. We realized we should have good sanitation. And we realized that we should enhance the ability of people to be nourished by getting a speck (?) of food production at a cost people could afford. So that got into the survival aspect of the infant, and with some support from the system, but it wasn't the perfect "mothers and others" kind of structure.

The churches helped to build that but it was a more varied. And now we move into what people call the post-modern society with these huge condominiums and whatnot where people are located and people move around and go everywhere - there's a huge movement structure, the "mothers and others" base has been weakened in terms of the traditional patterns that we've had.

And so one of the ways to build a "mothers and others" program for the future is think of early development as human development, make it part of your ministry of education, and then put in place with each of your primary school, programs for mothers and their children so you create a "mothers and others" climate for the mothers to come to with their children to take part in. You can do home visits with this of course.

And in the countries which are successful in getting high development, high quality development of their children, that's what, in effect, they've done. They've great programs for mothers with young children which are hubbed in a centre in the area where they live, which are basically part of the primary school system and they allocate, the Scandinavian countries, allocate some efficient resources to put these structures into place. And it's important to realize that the Scandinavians countries spend, per infant/toddler young child in the 0-six domain, $16,000 US annually per infant, child etc. in the program. They only spend $10,500 on children in the formal education system because structures change with parental leave isn't as important as it is in the early period.

Mustard - optimizing brain stimulation (1:23)

The question that comes up is why should people who are going to work with early childhood, why should they understand brain development? I guess the primary reason is that how you set up the experience for the infant and toddler and young child has a huge effect on brain development. So if you understand the story and the scientific basis behind this, then you'll appreciate that the problem-based learning i.e., play, that an infant or toddler is in engaged in should be optimizing maximum stimulation to the brain through a variety of sensing pathways. So if you watch all young animals, by the way, contact for them is important. They certainly look at you in the eye, watching a kitten in my household watches my eyes in spades. All these are sensing systems that go in and so the last thing I like to see is when I watch kids who are in a day care centre being pushed in a cart with the kids all looking forward, not looking back to the pusher, and the pusher is not talking to them. So if you think about optimizing of signals to the brain for its development, then the arrangement you set for the child will be different than if you don't understand brain development.

Mwitu – teacher training (3:09)

We do teacher training, providing professional development for teachers and this really includes the initial teacher preparation, as well as conducting refresher training for teachers who have already been trained previously, but really helping them to be abreast with practices that currently have been used in the country and world-wide. It's only in 2006 when in Kenya we had the first ECD policy, so prior to that, there were many providers of early childhood education training, ranging from the districts early childhood education centres, that national government institutions. Being able to bring these teachers together after maybe very many years of training, some were last trained twenty, fifteen, ten years ago, and they've not been able to have any other kind of training. Now Madrasa is coming in to provide a platform where these teachers can refresh their knowledge, they can refresh their skills and be able to gain confidence in their practices in the classroom, is something that is highly welcomed by the teachers, but also by the government.

It is exciting for them, very much, especially that the methods they have been using in the past are more of the talk and chalk; you know, writing on the board and really letting the children copy, or having the children repeat after the teacher. There's a lot of – there was a lot of wrought learning prior to our interventions. But now, being able to introduce the play-based learning and the benefits that come with it; you know, the use of materials in the classroom and how it promotes learning, you know, being able to put children together into groups and having the children learn from each other in a very friendly way, is something that the teachers have never experienced before. With the active learning methodology that we are trying to infuse now in the government ECD centres and in teacher training, teachers are seeing themselves taking up the facilitator role, rather than the ones who are actually directing the learning all the time, where they have to be in front of the class guiding the children on what to do and how to do it, rather than now providing the materials and allowing children to explore the materials and learn new concepts from those materials.

So what we have heard from these teachers is that these kinds of methodologies really enhance children's understanding of the concepts well, whether they're doing addition, whether they're doing basic scientific concepts like sinking and floating, it's actually done practically in the classroom, and children are able to converse among themselves and bring out meaning from what is happening, and also be able to understand. Therefore, even the retention rates of the children become higher than when we make them repeat and say each over and over again.

