

## Early Child Development and Human Development – Public Policy Presentation of Dr. J. Fraser Mustard

**MUSTARD:**

My theme today reflects the title of this seminar – this is probably a crucial issue for the world and for our society because the quality of human capital determines the quality of a society. Because of time constraints, I will move quickly through a number of ideas and then Clyde Hertzman will follow through with how communities can assess how well they are doing in early child development (ECD). Many of the points I will make come from the work of the Canadian Institute for Advanced Research (CIAR). Doug Willms and Clyde Hertzman are members of CIAR’s Human Development Program.

The three programs I will try to put together are population health, human development and economic growth. Clyde Hertzman, in the Population Health Program of CIAR, spotted that a large part of the health risks in adults were set in early childhood. This got the program to look at the biological pathways in early child development that affect the physical and mental health problems in adult life. It turns out that brain development is a major factor. Obviously if brain development in the early years is important for health risks in adult life, it is also important for learning and behaviour. Thus the theme for this presentation is child development not just early child learning since early child development is important for health as well as learning.

Fogel showed that the population of human beings on the planet has grown dramatically since the Industrial Revolution from less than 1 billion 200 years ago to more than 6 billion today. Look at this graph. You notice the kick upwards in population growth is pretty recent: it’s the

beginning of the Industrial Revolution. Fogel looked at this and tried to determine why population grew. He came to the conclusion that the population growth was because the outcomes for children improved tremendously in the last 250 years. He concluded that better nutrition was a major factor in improved early child development. Fogel also demonstrated that this extraordinary rise in the number of humans on the planet has also been linked to an exponential growth in new knowledge and technologies. We recognize that to cope with the new knowledge and technologies, we need highly competent people in our societies.

Fogel argues that each period of major technological knowledge change causes dynamic changes in the social and political structure and elements of society. He proposes that we are in the fourth great awakening, which sees a huge growth caused by the rapid growth in new knowledge and technology. One of the points he makes is that when people cannot understand the new knowledge and technologies, they tend to retreat from them. He believes this is one of the reasons for the increase in religious fundamentalism in society, because the knowledge changes are too demanding and it is not easy for people to cope with. He may be wrong but at least it is something you can think about.

One of the best measures of how well a society is making use of new knowledge and technology is a measure called Total Factor Productivity. This is the chart for Canada. I do not have the last ten years on this chart, but it doesn't change very much. You will notice that in about 1975 our Total Factor Productivity dropped. For those of you in publicly financed institutions, that's one of the reasons why you've had a tough job maintaining your budgets.

To appreciate Total Factor Productivity and primary wealth creation (this is an Adam Smith concept) and its effects on society, you have to

consider the other three quadrants that influence and are dependent upon primary wealth creation. In an idea-based economy you want to get the upper left hand quadrant (wealth creation) working effectively. The other quadrants are dependent upon the primary wealth creation of the upper left hand quadrant. The upper right hand quadrant is the publicly financed sector, which is hugely dependent upon how well that upper left hand quadrant is doing. All the small businesses in the lower right quadrant are also dependent upon the upper left hand quadrant. So if Sudbury's nickel base collapses, it is easy to picture what happens to the support of the other quadrants. Thus Sudbury's future will ultimately be determined by how well they can establish an idea-based economy before its ore body is depleted.

Abramovitz is an economist who argues that Total Factor Productivity is the way to look at the economy today. We don't usually talk about this in our newspapers. In his paper he asks what is needed to improve the health and well-being of populations and the quality of human capital – he argues, that what is important for economic growth is a public policy concerned with the socio-economic factors influencing human development and the establishment of appropriate institutional structures. In terms of the opening comments for this meeting, this is a very fundamental issue that societies must pay attention to.

These are the four Nobel Prize winners who have argued that the quality of human capital is key for economic growth. I will come to the last man: Heckman at the end of this talk. Heckman has basically looked at education in terms of its contribution to the quality of human capital and says that the United States has got a problem – and I'll come back to this in my closing comments.

Now I'm going to switch a little bit. I'm going to look at the distribution of human characteristics (health, education, etc.) in society. This is the gradient in health as measured by standard mortality ratios in socioeconomic class in the United Kingdom. Five is the bottom of the heap in the UK, and the top of the heap is one. You can see that at the top of the heap, the mortality rate is much lower than the mortality rate for the bottom of the heap. But you notice it is a gradient; there is no such thing as a threshold for poverty. If you plot the education performance of populations in the same way, you get a similar gradient. If you plot population behavior in the same way, you get a similar gradient.

In studying countries, these gradients can be steep or shallow depending upon the socioeconomic policy of the country – that means you can influence them in society. The lower portion that I showed you is in the lower socioeconomic status (SES), but there is no poverty cut off. These are linear gradients. Any attempt to change gradients in terms of performance in behavior, education, or in health, has to be universal rather than targeted to specific populations.

The CIAR programs in health and human development had to determine what the basic organ in the human body is that contributes to the gradients. If you want to look at the causes of gradients in health, learning and behaviour, you have to look at the functions of your brain. That means you have to look at how your brain develops in the early years of your life because this is a dynamic period of brain development. Most of you in education are plugging in to it later on in child development. Some trajectories in learning and behaviour may already be set by the time children enter the school system.

So let's take a quick summary of the brain's story. We can say – I think pretty categorically – largely due to the work of CIAR's programs in

human development, population health, and now with the experience-based brain and biological development program, that experience-based brain development in the early years of life sets neurological and biological pathways that affect health and well-being throughout life. If you look at any number of species, the conditions of early development that drive how the brain develops have a huge influence on behaviour, health and capacity to learn. Experience that the brain is exposed to by the inputs from our sensory pathways differentiates nerve cells for specific functions (e.g. vision, sound, etc.) and the connections between the different centres in the brain. Experience can affect brain function through its effects on the activity of DNA.

This slide shows the risk of depression in respect to your gene structure and experience. Serotonin is a chemical that affects your frontal brain. There is a serotonin transporter gene that will produce the protein involved in the interaction between serotonin and the frontal brain. What you are looking at are human beings who have what we call a short gene structure. SS means you got a short gene from your mother and a short gene from your father. LL means you got a long gene from your father and your mother. SL means you got one short gene and one long gene from your parents. What you have in the vertical axis is the risk of depression. This is from the longitudinal study of the Dunedin birth cohort in New Zealand; therefore the children have been tracked from the period shortly after birth to adult life. You will notice that in the SS group – if they are in a very abusive and neglectful family – the risk of depression is quite high in their twenties. If they have the long gene – even if they are in a very poor family situation – the risk is not increased. Here is an interesting aspect about societal interactions and resilience, which is both genetically and environmentally driven. If you have the short gene structure and are raised in a good early child development

environment, there is no increased risk of depression. The explanation for this gene environment interaction is covered by the term epigenetics.

If you have the short gene and you are in an environment negative for optimal development, the risk is that your DNA will be methylated which shuts it down. This is a gene shut down caused by an environment, it is not a gene defect – I want you to know that. We don't know how much of the story in behaviour and what other things are going to be actually patterned by this epigenetic phenomenon, but it explains a whole series of things that you will be dealing with professionally when you are dealing with young people – and psychiatrists are struggling to come to grips with what this means in terms of behaviour problems in children.

I will now discuss early child development and health. This is from the Swedish longitudinal study looking at adults in relation to what their early childhood conditions were like. This refers to the 0-6 year period. Good early childhood conditions are labeled as zero and poor early childhood conditions are ranked 1-4. What you are looking at are odds ratios. If 1 is good and if you are not doing as well as you should, the value climbs up above 1. Look at the lower right hand side: the risk of mental health problems, if you are brought up in very poor circumstances (the number 4), is 10 times that of people who are brought up in good circumstances. The same is true for circulatory disorders. The period of ECD has probably a greater effect on the risk for heart attacks and strokes than adult lifestyle behaviours.

The British carried out a study of the Inequalities in Health in the United Kingdom, which gets at the health gradients in society. Donald Acheson, who chaired this commission, was a fellow Dean at Southampton when I was a Dean at McMaster. Following up through life of successive samples of birth, his committee concluded that the conditions of early life

had a major effect on mental and physical health in adult life. This story is largely ignored in most of the discussions about health in our society. I expect that this is not well taught in your school systems.

Behaviour. Tremblay, another soul mate from CIAR, has looked at antisocial behaviours (which includes attention deficit disorders) in children. From his longitudinal study, he shows that antisocial behaviour in adolescents and adults demonstrated behavioural problems when they entered the school system. All of you in the teaching profession experience this. The origin of these behavioural problems can be traced back to fetal development and infancy. High quality care support during the first three years reduces the seriousness of behavioural problems. If you want to reduce behavioural problems in the school system, then it is important that you get an investment in the preschool period. The biological pathways that are involved are strongly affected by touch in early life.

You have all seen this. If you have a class with kids with chronic aggression (on the right hand side), the bulk of these kids will not get their high school diploma – only about 3% will get it. Whereas if you have a group of those on the left hand side, that behave well and never become aggressive, about 75% of them will get their diploma. What the bottom line shows you here is that only about 14% of children in Tremblay's work are in the 'never aggression' class. A huge chunk are in the 'low aggression class' – it is about 53%. Then there is a 'high aggression' group – about 28%. Of those, only 27% get their high school diploma. It is a perfect gradient and we know that this gradient can actually be changed if you can get the preschool children in good ECD programs. It is very difficult for you to change behaviour in the school system.

Literacy. This is the Organisation for Economic Co-operation and Development's (OECD) assessment of literacy. Level one people can read a prescription but not understand it. Level 2 are slightly better. Anybody in the practice of medicine knows how hard it is to communicate information to people in those categories. Level 5 is the top of the heap. I doubt the Globe and Mail sells to the people in levels 3, 2 and 1.

Doug picked up the gradient story and translated it into the work of the OECD on literacy. The concept of socioeconomic gradients that Doug learned about actually came from the teaching of Clyde Hertzman – I just want you to understand all that. What you have at the top are the document literacy scores for Sweden (blue). It's above the international mean, it's not too steep, and it's not bad. Canada is yellow - we are not equal to Sweden, and we have a portion of the population below the international mean. We can certainly get to the same gradient that the Swedes have by raising the learning bar. Holland is pretty good and then you see Chile at the bottom, it's a basket case – and this is true for every Latin American country but one - interesting.

These are the proportions of the population at levels 1 and 2 and the levels 4 and 5 in the document literacy scores from 1994 to the 1998 ages 16 to 65 OECD study. You see the Swedes have a relatively small proportion of their population at levels 1 and 2: 23%. We are at 42%, and I think the new figure is still 42%. For the levels 4 and 5, the Swedes are higher, Canada is 23%, Australia is not as good as we are, and the United States has got a problem with 48% of its population at levels 1 and 2, and 18% at levels 4 and 5. Chile has 85% at levels 1 and 2 and 3% of levels 4 and 5. The reason why this is important is that this is not simply about the difference between literate or illiterate. This is the ability to understand the written words, which is hugely important. To me, if you want a high

quality world that can cope with the needs of the future, you want to have a highly literate population.

This slide shows language and literacy performance for Latin America. Again Doug Willms did this work with UNESCO. The exception in language and literacy performance is Cuba. Why is Cuba able to do what it achieves and the other Latin America countries are far behind? Cuba is a Communist society and poor – it has, in comparison to other Latin America countries, a low gross national product, whatever that means.

These are the grade 3 language test results in Latin American countries. I've just shown four of them with Cuba. The mean value in language scores in grade 3 in Cuba is two standard deviations higher than the means of the other Latin American countries. Nobody has studied Cuba and tried to figure out what went on. Those of you in education would say it's because of the school system. I don't believe that. Castro did a couple of things that were important as far as ECD is concerned: he invested in a primary health care system and in supporting young mothers and their children – I think you see the direct spin off of this in that society. Hopefully we can get some people to study what has happened. This may be one of the best population-based database that suggests that Doug Willms' argument that you can raise the learning bar for all children and this can actually be done if you have the right policies.

What about Canada's children? When we did the Early Years Report, we asked the Government of Ontario for figures about the status of children in our province. They said they did not have anything. If they did, they would not give it to us. I don't know exactly what the problem was but fortunately Canada had a longitudinal study of children and youth, which involved Doug Willms. Since he had worked with me in the Institute, I said, "Doug, what are the vulnerable children in Ontario like compared to

the rest of Canada?” There you can see that about 40% between the ages of 4 and 6 (which is the school-entry period) in the lowest socioeconomic classes are vulnerable, compared to about 10% to 12% of the higher socioeconomic class who are vulnerable. We said to Premier Mike Harris: “Why is Ontario, which is wealthy, not doing better than the rest of Canada?” He didn’t know the answer to this question. You notice this is a linear gradient. This means that the bulk of the children who are vulnerable, in terms of the total numbers, are in the middle class. So it isn’t a question of poverty, but of what you are doing in society. Doug conducted a couple of other analyses with this data and showed that even if you are poor, if you read to your children and give good social support, they perform pretty well. So it is more than just money that’s driving these developments.

Can you do anything about poor ECD? There are a number of intervention studies, which are pretty reliable in terms of what they have done. I’m only going to show you one of them. This is the Abecedarian Study where they randomize children shortly after birth into four groups. These are children of African-American mothers in North Carolina. The mothers all had IQs less than 80 and so it was a population with a very poor start in terms of what the parents were like. They randomized the children into four groups: do nothing, a special education program when the kids entered school in the first three years (the blue bar), and a preschool program beginning at the age of approximately 4 months which was really basically centre-based care involving the parents (the yellow bar). The green bar is the centre-based care plus the school program. If you just look at the language capability at age 21, it is the kids who have a good start, and who come into a school system with a good program that do well at age 21. So if you are really trying to change literacy in your communities, this is a stunning lesson for all of you. You won’t do it

just in your school system. You have to have a preschool program that is part and parcel of what you are trying to do.

For those of you who are right-wing, this slide is for your benefit. For those of you who are left-wing, this is also for your benefit. The yellow dots are economies which Peter Holmes, an economist of the Institute in the Successful Societies Program, calls coordinated market economies. The best way I can describe these economies is that they are free market capitalist economies with social accountability. The red dots are free market capitalist economies with no social accountability, of which the prime actor is the USA. What you have on the bottom part of the chart (this is from the OECD database) is literacy inequality. The right hand side is a high degree of literacy inequality - the United States has the greatest literacy inequality. The vertical axis is the Gini Coefficient. A high figure there means a high degree of income inequality in a country. The market economies with social accountability, the co-coordinated market economies, have a high degree of literacy equality and a high degree of income equality. If you want to think about the structures of society, and how they function, this is an extremely important lesson for all of you in terms of the dynamics of societies and how they function.

So what should the public policy be? We argued in the Early Years Report that you should set up early child development and parenting centres (ECD-P). Why should parents be involved? Because the best way to learn parenting is by being part of the center and learning parenting by doing. We actually managed to get the Federal Government to grant families, particularly mothers, a one-year leave with some income when they had a newborn child – the last 6 months can be spent between the father and the mother. This was a breakthrough! You want to have mothers with young children – infants – part of the centres as soon as you can because the best way to learn parenting is in conjunction with others.

We did not succeed in getting each parent one day per week off from the ages of 1 to 3 to be part of the centres, but we do know that if you do that, you can greatly improve the outcomes. This is because the brain stimulation story is not just in the centre, but also in the home, and you want to get those things working powerfully together. This says ECD-P programs should be universal, accessible and voluntary – you don't have to make it compulsory; pregnancy to age 6 – we think women should be allowed to join when they are pregnant, and encouraged to do so; centres should be community-based, and certainly, linked to primary schools. Children's services should also be linked to those centres and not treated as something completely different in terms of activity.

There is a need for well-educated and trained staff. The remuneration for quality staff in this area has to be the same as what you pay your professional teachers. Outcome accountability is hugely important. Clyde will talk to you about EDI and what that means. It is hugely important that there be an outcome measure that says how well each community is improving early child development. If you want to do this, you will need to integrate existing programs: non-parental care (which some people call daycare), family resources programs, kindergarten, home visiting etc. You don't want all those things out there fragmented. You want to create a hub system that can really work to do this. The place in Toronto where this is actually being done is First Duty, which is attempting to do this in five schools. One of those schools where they are succeeding most is Bruce Public School where daycare, kindergarten, family centres, and parenting centres have all come together. The principal has been able to bring all of that together so they can work despite union and pay differences.

The Economist magazine, in writing about this subject several years ago wrote, "the principle of free education for school-age children is already

entrenched throughout the rich world; there would be nothing incongruous about extending it further down the age range”. They wrote that in 1998, which is remarkable for this magazine, which tends to be right of centre. However, they are dead on! If you want a quality society, you and I, as taxpayers, will have to encourage our governments to make those investments.

Here is an interesting thing for those of you in education. This is a recent paper by Belfield, an American, looking at school and preschool programs in the United States. I think these programs generally are beginning at age 3 – they don’t come down earlier yet – but they reduce special education needs in the school system. This is hardly surprising. If you think of that in terms of cost-benefit, it’s much better to make the investment in preschool and get that saving so you don’t have to dump your money in special education programs. Grade retention is reduced – important – and economic achievements are improved. If you are running a school, if you are good in academic achievements, the teachers take pride in it. This is an extremely important story that comes out of this recent paper by Belfield.

Heckman is a US economist. He received the Nobel Prize in Economics in the year 2000. He became possessed by the failure of the education system in the United States to produce the quality of human capital necessary for the future. He’s talking about more than just education levels. He’s talking about behaviours and attitudes, and he does this analysis. He pulled all the data in the US he could get his hands on and came to this conclusion: “We cannot afford to postpone investing in children until they become adults nor can we wait until they reach school – a time when it may be too late to intervene.” This is a hard but important message.

This is the return on investment curve from Heckman's analysis (and he's not yet put in the health data because it is a hard data system for him to track and work with). He argues that in the preschool period (on the left hand side – from birth to age 6) the return looks like it is at least \$8 for every \$1 invested in that period. For the school period the return is about \$3 for every \$1 invested.

Van der Gaag is a Dutch economist whom we work with at the World Bank. He says early child development affects education – the level of education and competence, literacy etc. It affects health; it affects social capital, which is the quality of your society and social equality. He argues that these are primary factors affecting economic growth. Going back to Fogel's argument: in a world with an exponential growth of knowledge and new technologies, you surely want a good, dynamic, and integrated society with high quality human capital.

A group of us has created a Council for Early Child Development and Parenting. It is a not-for-profit organization, it is national, and its objective is to establish ECD and Parenting Centres linked to the school system and supported by all sectors of society, including government, that are universally available to all families with young children. The Bruce School in the First Duty program was developed by the Toronto District Board of Education, the city government, Public Health, the Atkinson Foundation and the Canadian Autoworkers. Hopefully public policy can keep up with these developments.

This slide shows the present leaders. Charles Coffey, one of the Senior Vice-President of the Royal Bank, is the Chair of the Board; Robin Williams, of public health in Niagara and one of your colleagues, Jim Grieve, are both Co-Chairs to try to push these ideas further; and the Co-Directors of it – they would not do it separately – are Jane Bertrand (who

is not here) and Kathleen Guy who is here. You may want to talk to Kathleen if you are interested in how this is moving forward. I can tell you that we have fair prospects of pushing this in Manitoba, parts of Alberta, and probably in Saskatchewan. Clyde's work in British Columbia leaves us optimistic that there will be major developments in that province. Hopefully Ontario will get its act together and not be a basket case.

This is my story; I will now turn it over to Clyde. Clyde is one of my better students because he has come a long way and taught me a great deal.

END OF PRESENTATION

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