



Professor Knut-Inge Klepp – The European Pro Children Study

Thank you very much to the World Cancer Research Fund for inviting me to come and present this work this afternoon.

The project that I'm presenting is a four-year research project called the Pro Children and it's funded by the European Commission. It finishes in March 2006 and today I'll share some preliminary results outcome results.

There are nine countries that are participating the in the study: Norway, Spain, Iceland, Denmark, Portugal, Austria, Denmark, The Netherlands, Sweden and Belgium. We have a nice north to south gradient within Europe, which we thought was important since this traditionally has been a strong gradient when it comes to fruit and vegetable consumption within Europe.

The main objective of this study was to develop effective strategies to promote increased consumption of fruit and vegetables among school children and the main target group at 10 to 12 year olds, but also focusing on their parents. The study had two main components. One was to conduct national representative surveys within all the nine countries and then to develop comprehensive intervention programmes and test them. This was done in three of the countries: the Bilbao region of Spain, Rotterdam in the Netherlands and the county of Buskerud just south west of Oslo in Norway The main goal was to produce a 20% increase in reported intake levels of fruits and vegetables.

So why focus on children? Well, as has been pointed out this morning, there are good reasons to focus on fruit and vegetable as it has proven to be protective of both cardiovascular disease and a number of cancer sites. Also, children are at an age where they are developing their eating habits. And if successful, you might be able to have a long lasting impact on their dietary habits. Addressing the diet of children might also be a very good way of reaching parents and parents who are also a very important target group as well.

We knew that there was a great heterogeneity in intake levels across Europe and we wanted to explore this and see if we could also use that as an incentive within an educational programme. We also knew from previous work, that a large majority of school children did not meet the recommended intake levels for fruit and vegetables.

Food balance sheet data from the FAO shows the north south gradient that we have less intake of fruits and vegetable in the North than in some of the Mediterranean countries. It's the same picture for both fruit and vegetables. The UK is in the middle.

About 10 years ago a study done to see whether Europeans believe that people in their own country should eat more fruit and vegetables. The large majority thought that people should eat more fruits and vegetables. In England it was 94%. This point has been mentioned by other speakers today – that people have some level of knowledge, or some level of awareness and might think that they know it all when it comes to fruits and vegetables.

A large study called the Health Behaviour in School Children survey is conducted every four years in a number of countries and this also shows the north to south gradient. Children from Portugal, in particular, virtually all the girls report eating fruit everyday. In Norway we were



happy that Greenland participated in the study, otherwise we would have been at the far bottom. Again England is also fairly low down on intakes, so clearly there is a great potential for improving.

We also have seen that even among children there is a social gradient in that children from lower socio economic status groups tend to eat less fruits and vegetables than those from higher socio economic status groups.

Data from Scotland, published a few years ago, used a fairly crude measure of an affluent scale, where the children reported whether the family had telephone, or car, and the number of bedrooms. But, even with that crude index there was quite a strong gradient, particularly for vegetable intake. So, this is again an important focus when you look at fruit and vegetable consumption among children.

So, in the Pro Children project we set out to develop reliable instruments for assessing fruit and vegetable consumption in this young age group. And to assess determinants that could help explain the variation in intake. We were also interested at looking at cross national differences, and also to look at local, regional and national policies, when it comes to fruit and vegetable consumption.

The other main objective was to design what we called the cultural relevant, but theoretically similar intervention programmes, and assess what factors help promote implement these programmes, and what would be important barriers to implement the planned intervention. And also, looked to see how the various intervention components were perceived by student, teachers and parents. And to see whether a programme like this had the intended effect and whether a positive effect could be explained by the determinants that were identified. We also hoped to do some cost effectiveness analysis from this study.

We started out using a theoretical model that is a modification of the Theory of Planned Behaviour, which states that attitudes, the social influence and self-efficacy impact our intention and we tend to act as we intend. There are some very strong barriers that might prevent you from acting out on your intention and also that you need skills, both practical and social skills to act out your intention. The model also acknowledged that our behaviour to a large extent impacts our attitudes and social norms. We often have these models going only in one direction, but here we acknowledged that our previous behaviour is an important determinant.

But as the project evolved we ended up with a much more complex theoretical framework where we have looked at various cultural and environmental factors. We looked at the physical environment e.g. national, community, school; the social environment e.g. peer group and family and what we labelled personal factors such as knowledge, attitudes, preferences and liking of fruit and vegetables.

When it comes to physical environment looking at availability issues, both at national level, community level, school level is important as is the perception of the availability at a fiscal environment. We also looked at socio economic status and also more macro differences between the various countries.

As a consortium we had English as the working language. But all of us had English as our second language and the research tool for measuring fruit and vegetable consumption was



translated into 13 different languages, so that was quite a process to do official translation into the local languages, and then official back translation, and try to see whether the meaning had been contained, and also to sort out what was culturally relevant or appropriate to ask in the various countries.

We took random samples of schools. And ended up with a total of 375 schools across the nine countries, with a total eligible student population of more than 15,000, and we were pleased with the high participation rate of 90% across the sites. We did this as a two generation study where the pupil at school took a questionnaire home and gave to one of their parents. And we had 76% of the parents return the questionnaire, which we also thought was good. As you may imagine, the large majority of the parents were mothers. We also surveyed schools principals or others at school and ended up with a high participation rate also for the school survey.

Overall the observed average intake of fruit was an average of 140 gram per day. And this is using a 24 hour recall format where the children recorded all fruits that they ate the previous day, it excludes fruit juice. There was variation across countries, Iceland being at the lowest end with Austria, Denmark and Portugal at the highest end.

For vegetables the observed intake was an average of only 80 grams a day. If you add the fruit and the vegetable you will see that the large majority is quite a bit below recommended levels.

Looking at the breakdown of vegetables there is variation across countries as to what the major sources are. The categories included salad, raw vegetable, soup vegetable and cooked vegetable. It's interesting in Portugal and also in Belgium where they have high intake, it is the soup vegetables that really constitute the major part of the vegetable intake. And Sweden is high here, maybe primarily because they have a free school meal that offers both salad and cooked vegetables free to all the children everyday at school.

There was quite a variation between the countries and what's interesting here is to see that Spain was competing with Iceland to be at the bottom level. This points to the large transition in diets that's happening in some of the Mediterranean countries and is supported by previous data from Spain.

Looking at the proportion who say that they eat fresh fruit at least once a day there is again, quite a lot of variation. And consistently across all the countries girls report somewhat more frequent intake than do the boys. And for vegetables the same, with the Netherlands, Portugal and Belgium have the highest proportion reporting to eat at least once a day.

The study looked at whether there were factors associated with daily fruit and vegetable intake and whether they were statistically significant. For personal factors this included level of knowledge or awareness about recommended intakes, attitudes, liking of fruit and vegetables and perception of barriers. Social environment factors were also looked at for example whether parents actively encouraged children to eat more fruit and vegetables, to what extent parents facilitate increased fruit and vegetable consumption, for example, by cutting it up and making it readily available in the home. It's interesting to see that 11 out of the 15 factors we looked at turned out to be significant.



The pattern for boys and girls are quite similar, although there were some differences in the strength or magnitude of the health ratio, but overall it's a very similar picture. When this was broken down by country, for fruit it was a very similar pattern across countries. But that was not the case for vegetables, there was more variation across countries, but still we found that 11 out of 15 factors were significant.

Going a bit more into the issue of availability, we had a number of questions trying to assess their perception about availability, asking questions such as 'If you say at home what fruit or vegetables you like to eat will it be bought?' 'Are there usually different kinds of fruits and vegetables available in your home?' 'Are there usually fruit and vegetables available that you like?' And then similar questions from out of home, like at school and at leisure activities and when visiting others.

And these items were scored from one to five, where a five means that it's very good availability - it's always available. And the finding was that across country the kids reported foods to be readily available at home and here there were no gender differences. But it was much less seen as available outside home. And it was the same pattern then for vegetables, a little less available than fruit, but overall seen to be available at home and less so outside home. Again here Sweden sticks out probably because of their school meals.

When we designed the intervention programme we tried to apply what has been called intervention mapping, which is one of these planning models that are around that really help you to go through step by step and have a more systematic approach to developing your intervention. According to this technique you try to define the programme objectives. You use different theories and link them to practical strategies for reaching these objectives. You make a plan for the programme itself. And then you adapt it and implement it and then you have a specific plan for evaluating your intervention. It's a five step approach that we go through.

The first task was the performance objectives which could be to make children aware of their own fruit and vegetable intake. Also, have them ask for fruits and vegetables and be able to prepare simple fruit and vegetable dishes. And then to see what are the specific determinants that would guide these behaviours, so both looking at personal factors, such as awareness or what is the recommended level and awareness of their own intake, self efficacy and practical skills in order to achieve this and taste preferences. And looking at social factors, such as peer influence being ... making them aware of the peer influence that might be among their friends and also how they are influenced at home, and then looking at the availability within their immediate environment.

Within the target group or 10 to 12 or 13 year olds we know that there are differences based on socio economic status, to some extent on gender and also ethnicity, and these needed to be accommodated within the programme. As I said, we tried to have a somewhat similar programme being implemented across the three sites, but because the situation in Spain, Rotterdam and Buskerud, Norway are so different in many aspects when it comes to fruits and vegetable consumption that, of course, had to be taken into account when making the country specific programmes.

One thing that we applied in this programme was the so-called computer tailoring system, where the children were able to enter their own intake and fruit and vegetable and get personalised, computerised feedback. And we wanted them to be able to use this



programme, to read and understand the feedback. And also then develop practical skills so that they could identify what was a portion of fruit and vegetables.

The actual intervention programme was school based. We had a classroom curriculum that included a number of worksheets that the children were to complete at school or to take home and complete with their parents. You had computer tailoring that was offered at school. We had a web site that we tried to encourage the children to communicate with other Pro Children students, also across the country, and to capitalise on the diversity that was then between Spain and Norway, for example. One major barrier here, of course, was language that these are young children just starting to learn English at school. So, that limited somewhat the use of the website.

We looked at what is available within the school, introducing fruit breaks and making fruits and vegetable more readily available at school. There were special school events and we also tried to have project committees consisting both of teachers, school health workers, parental representatives that could help implement the programme at school. And we tried to influence the school policy so that they would have a food or nutrition policy that would promote fruits and vegetables and take out other more unhealthy food items.

In Spain they have school cafeterias where some of the children that qualify will get a school meal. In the Netherlands there is no school meal. It's quite common still that the children go home and eat in the middle of the day. While in Norway there is no school meal offered, but children bring their own, usually sandwiches, with them to school. But in Spain then they tried to make the menus offered in the cafeteria including much more fruits and vegetables.

We also had a family component and there were problems involving the parents. We used newsletters. The parents seemed to appreciate them. But the moment you have their attention is very brief. And we had school events that turned out to be quite successful for those who showed up but, of course, it isn't all parents that come to those. And then we also offered a computer tailoring programme, or an adult version of the computer tailoring programme, to the parents.

We tried to address the larger community by working with school health services. That was done primarily in the Netherlands, tried to work with the mass media, particularly the local mass media, getting them interested in the project and writing about the project in a way that it would reinforce messages that were given at school. And we also tried to have collaboration with local grocery stores, so that they would invite school classes in and explain how the issues for them, when it comes to handling and promoting fruits and vegetables.

We have a website www.univie.ac.at/prochildren/ where you will get a lot of this material, including the computer tailoring programme and our research instruments.

A few more words about the availability, which we saw as a key factor, and how that was played out differently then in the different sites, in Spain, as I said, we tried to make it more readily available as part of their regular school meal. But in addition, a special fruit break was introduced. And to start with local retailers were providing free fruits and vegetables to the school. And later on the parents took on this and the children would bring then fruit to the school. And this was then carried out throughout the whole school year that intervention lasted. Some had it everyday and others had it just a few days a week. And this was seen as a very positive activity, both by teachers and the children.



In the Netherlands, as I said, there's no organised school meal, but there is a national fruit programme being implemented now, somewhat similar to the UK programme. And that was then pilot tested as part of the Pro Children programme. And again, it was seen as a very positive programme. The children received free fruit then twice a week. And the children enjoyed it. And I guess the main complaint was that there were too many apples and too little variation. That seems to be a problem that runs across the different countries doing this.

In Norway there has for the past 10 years been a national subscription programme that is subsidised but the parents have to pay about Norwegian Krona 2.50 per day, that's €0.30, for children to get an apple or pear, carrot, banana, orange at lunch time. The programme is offered in all countries in Norway, but the participation rate has been quite low. About a third of the schools are participating and about a third of the children in the participating schools are participating. So that we still only reach about 10 to 15% of the total student population. And the fact that they had to pay for it seems to be the deterrent for quite a few parents.

What we did in this as part of our programme was that we had the schools to commit that they would enrol in the programme. And we had a lot of informational and motivational material to parents to have them sign up for the programmes. And we provided proper storage facilities, some kind of not refrigerator but cooling cupboards for the schools, so that they had proper storage, which has been a complaint previously, and also tried to facilitate the administration of the programme within the schools.

In another study this programme has been tested when it was given for free and there it proved to be very successful and produced a large increase and all students, all schools did participate. But data from the same study indicate that when you help parents pay for it is children of parents with higher income and higher level of education and the children have higher intake levels to start with who tend to subscribe. So that rather than reducing social inequality you might actually contribute to increasing it by a paid subscription programme.

The Pro Children study was conducted as kind of a randomised controlled trial with school being the unit that was randomised. And we had 24 schools then randomly assigned to intervention or comparison group in the Netherlands, 18 schools total in Norway and 20 in Spain. In the Netherlands and in Spain it was 10 year olds that were targeted the first year, while the children were 11 year old to start with in Norway.

The core intervention was then implemented from October 2003 and through April/May of 2004. And we did the first follow up study in May 2004 and then continued the intervention for one more year. But it was more limited and there were a number of booster activities. For example, the first year we have had a recipe contest within all the three countries. And the second year a cookbook was made by all the winning recipes across the countries and that was handed out. And we also focused quite a bit on the computer tailoring aspects of the programme this second year. And then in May last year we did a second follow up survey.

Briefly about the results, the goal was to have a 20% increase in fruit and vegetable consumption. 20% was seen as an ambitious, but at the same time realistic goal. And the data from the first follow up after the first 12 months showed that we had been able to produce about a 20% increase, a somewhat higher increase for fruits than for vegetables. And we have now looked at the follow up data from the two year follow up survey and these positive effects seemed to have continued also after two years with results being somewhat stronger for fruit than for vegetable consumption.



We have also started looking at some of the process measures. And we do find that the degree of programme implementation varies a lot, both from school to school within country, but also from one site to another. In Norway we have Home Economic as a special subject, and it was the Home Economic teachers who implemented the programme. And the degree of reported implementation was quite a bit higher than ... in Norway than in the two other sites, where it was the regular classroom teachers who had been implementing the programme.

Some of the schools did an excellent job in implementing the programme the way it was intended from our side. And we had teacher training workshops in all the countries. And they've really followed the manuals. Some schools, for various reasons, dropped out completely and did not implement it at all. And the majority were somewhere in between there. But looking just preliminary at the data I would say that the overall implementation ranged from what I would label medium to low. And it was clear that the teachers in all these three countries feel quite overwhelmed by all the various tasks they have to take on. And that it is difficult to devote as much time to a programme like this as we would have hoped.

But what we did see was the degree of implementation clearly was strongly associated with success of the programme. And we also found across all three sites that the teachers overall really like the programme. And the children also very much liked the programme.

So, in conclusion then, the Pro Children study is the first international multi-site study specifically designed to investigate factors predicting fruits and vegetable intake among school children and parents, and also to look at the effectiveness of intervention programmes. The results demonstrate that our large variation in intake across countries and also in the level of determinants among European school children. And the preliminary results then indicate that we were successful in increasing the consumption level with about the magnitude of 20% that we had set out to do.

So, some of the key lessons learned and that I think might be applicable to the situation that you have here in the UK as well, is that I think that intervention studies really should focus on building awareness about what are recommended intake levels and what are the actual intake levels, because it seems as if also children have an inflated impression of how much they eat. So, focusing on their actual intake and comparing that to what is recommended seemed to be a strong motivational factor.

The other issue that really come out quite strong is making it available for children, both at school and at home, and so focusing on parents the main issue there should really be to give their parents concrete skills for how to making it more readily accessible for children in home. And we found that just cutting it up and putting it out there probably is the one factor that seems to be the most important for children at this age group.

Educational programmes implemented at schools should probably be short and focusing on a few key activities as we see that a number of teachers had problems implementing larger programmes, taking more time. But then it should be repeated over time, so that it shouldn't be a brief programme as such, but maybe stretching it out over longer periods of time.

And then we also strongly believe that trying to foster good collaboration between the different actors within the school. So, the pedagogical curriculum, working with teachers, but



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also involving the school health service and the fruit providers is a key thing to be successful in this area.

So then I just want to acknowledge the core investigator on this study and also the European Commission for the funding. Thank you for your attention.