

Seminar 3: 'Moving beyond tax-benefit and demographic modelling'
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A microsimulation model for projecting family and kinship networks in Britain

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[EDITED TRANSCRIPT]

My work is part of a project called MAP2030 which is funded by the ESRC under their new dynamic ageing programme and it includes a number of different institutions. Ruth and Marcello will be talking about their work later. There's a website if people want to look for further details about the project. But it's basically a series of mainly microsimulation models, looking at a range of what we regard as the key needs and resources of older people in Britain in about the next 25 years or so, mortality, health status, family and kinship, resources, household of families and how they interact with the pensions and long term care systems. I'll be talking today about family and kinship and Ruth and Marcello will be talking about long term care in this.

And the context of this is that we're expecting any day now a green paper on long term care policy in which the Govt will be putting forward some proposals and then there will be a period of reflection and reaction to proposals. And this work is designed to feed into that.

For people not familiar with EU-type projects we've broken it up into work packages and we have four main packages which feed in to the core of the project which is projections of pensions, incomes, savings, care and in particular expenditure on pensions and long term care. And those are the four areas which feed into this.

I'm talking mainly about family and kinship resources and the background is that we expect the number of people, for example aged over about 80 who are the heaviest users of care to more than double, sorry that 40% should be taken out, it's double in the next 25 years, the number of people over pension age to increase by about 40%. And the question is will there be a care gap, will there be enough informal carers around in the future to provide the needs for older people? And if there aren't, then there may have to be more formal responses to if you like meet the shortfall in that.

So if we're looking at kinship resources and we're talking about people aged let's say 80 and 100, then you're looking at people who were being born 80 to 100 years ago, and they're people who were coming into the world about the time of the so called first demographic transition. But if fertility declined from a level of about five children per woman in the last 19th century to below replacement level fertility today, this process has been going on for the last century or so. Mortality has improved, so that life expectancy at birth was around 40 in 1900 but about twice that today, and one of the implications of that mainly due to the decrease in fertility has been that the proportions of population aged 65 and over are now around 20% in many developed countries, have increased substantially over the 20th century, are expected to continue to increase into the first half of this century.

We overlay this first demographic transition, this fertility decline and mortality decline with what's called a secondary demographic transition which basically was meant to be started from perhaps the 1960s, which was a partnership transition with substantial reductions in nuptiality, in people marrying, marrying later, not marrying at all, increases in non marital cohabitation, increase in divorce and proportions of births outside marriage. And all these are likely to have implications for kinship resources on older people because divorced people had very different patterns of interaction for example with their children, particularly men compared to for example divorced women. More divorce means more, reconstitutes families, more complex living arrangements, the possibility of you know other people having supplanted former natural parents etc. Cohabitation tends to be more fragile than marriage so people are, may well not have the spousal or the partnership resources that they might have had in the past in the context of high rates of marriage.

So we're looking at the impacts of you know some of these changes, both in terms of fertility and mortality and also partnership on those who are directly involved as individuals, on the national population structure, this is population ageing at the macro level, but also there's a sort of meso-level, the impact on families and kin of these sorts of changes. And so what would be nice to do if you're, one needs to look at the whole area of kinship patterns is to have a sort of

model that can incorporate the whole kinship system being a single model and therefore you could analyse the key family and kin networks of older people.

Now I want to try to pick out the sort of key parts of the kinship network. Well for example one of the main ones is simply that of children in the EUROFAMCARE study, 49% of family carers of care for elderly people were children, about 22 were spouse or partners, so they dominate informal care for older people. But we also find for example that divorced fathers have less contact with their children than fathers who were not divorced. People who remarried actually tended to do also as badly as divorced people in terms of contact, there seemed to be an effect there as well. For mothers the effect is much less, so one would want to look separately at these two groups. And even things like parental roles is important. I mean in a German survey, 25% of people said that they were, they were children said they were either highly or very highly emotionally close to their grandparents in Germany. And of course there are two issues there, one is that their grandparents may not be alive because they've died for various reasons, the second reason is that if there's a parental disruption in the middle generation that may have an impact on the relationship and the availability of grandparents and grandchildren.

So what's the background to this? We're looking to try to model the kinship networks of people at a particular point in time. Now that's determined solely by fertility, mortality, nuptiality which includes divorce and cohabitation, experienced by that population for many decades back into the past. It doesn't necessarily matter, frankly fertility doesn't matter at all if you're an 80 year old about your current kinship networks, it's what happened to fertility in the past you know 80 years ago will determine how many siblings you've got. But as long as you know those parameters you can reconstruct the full kinship network, you may have to go back beyond actually the life of the people concerned.

Also it will show that the contemporary pattern of kinship, the networks are strongly influenced by recent trends, especially by the so called secondary demographic transition where things like numbers of step kin, half sibs etc, former partners due to cohabitational breakdown and divorce, but also in the longer term these patterns through the second half of the 19th and 20th century of fertility and mortality also have a major impact as did things like the baby boom which occurred in the 1960s in many European countries.

There's actually very little information available in most countries on kinship in large nationally representative data sources, there are very few sources that collect information on anything apart from spouses, living children is not collected routinely in many surveys, if it's collected in surveys I'm very sceptical about the quality of much of the data that is actually published about that.

So you may actually be better off trying to build a model which is more integrated, more comprehensive than relying on the fragmentary published data which are available. And also then of course with a model you can also project that into the future which is not possible simply by looking at you know cross tabulations of different types of kinship.

So it's a microsimulation model which is based on individual level rules. So we start with a known or assumed population and then simulate individual demographic events, and so you produce a set of individual records you know which has the correct statistical or macro level behaviours that one would expect to see in the real population. That's very straightforward.

But what's particular about kinship modelling? Well I mean people have talked this morning about for example taking a current survey like the FRS and using that to simulate your population, that's not an option in terms of kinship because there is no survey you can base a kinship survey on. So it's not oriented towards a current contemporary survey. It's conceptually more complex for example than household modelling because a household is well defined at a point in time, you can collect information on households relatively easily but they often tend to be quite demanding in terms of their data requirements. And so this actually may require a rather different form of analysis from many of the more standard microsimulation models. And one has to actually go into the past to build up this model using, as I say the statistics I mentioned before of long term fertility, mortality and partnership trends.

Well as this model is designed to give some insight into policy at the moment and what might happen in the future, I'm going to concentrate mainly on what's happened in that last 50 years, what may happen into the next 50 years or so under various assumptions. And what I'm using is a model that was actually originally developed in Berkeley by G Ham or Ken Wachter and Peter Laslett from Cambridge, the so called SOCSIM model. And you start off with the initial population

and you simulate that forward to produce the appropriate kinship networks. This application started with a population of about 40,000 which is big enough so that the sampling variability doesn't become an issue in this model, but I started at 1751 to allow the model to have enough time to build up the full set of kinship links. If you, looking at for example whether people have grandchildren you've got to look back a long way to find out what's happened. If you're looking at they've got, you know, if you're looking at the older people have got siblings, you've got to look back even further to what was happening to their parents who were partnering, etc. So really going back well over 100 years of you're looking even at older people's sibship links already.

If you want to go, so let's go back, and you want to get some sort of long term run into this, so we go back to something like 1751 and you can start off with an unrelated population and just let them marry, procreate etc, and over time they'll just build up kinship links until at some stage that network is sufficiently rich that you can then you know start to make judgements and draw some conclusions about what's happening.

So we just simply you know apply the appropriate rates of fertility, mortality, nuptiality to the individuals month by month and it's usually a Monte Carlo method as usual and so you build up these kinship links over time.

In this particular model, it's a close model so partners have got to be found within the existing simulation of population. For kinship you've got no option, you just, you can't bring in somebody because everyone's got to have their own set of kinship links as well. So it's a closed model and it obviously has the complexity of all of that. Included within that population are insets between siblings and parents to make it realistic, they include cohabitation explicitly, married and cohabitation are modelled individually and you apply people for example to move from being cohabiting to married or breaking up. And you can just then choose any kinship relationship through living or dead kin in this system.

A bit about the system. It's written in C, in four incarnations, it's been written in Fortran and Pascal so it's a somewhat you know venerable programme compared to many of these. But if it ain't broke don't fix it, and it still works very well and it's still I think much better than, well there is no competitor I think at the moment which can write anything like this functionality or this programme.

I've found people who are interested in programme issues use heavy use of pointers to generate the sufficient statistics for the whole kinship networks, partners, eldest child, next oldest sibling, parent etc, we actually, you know you simply have these points and you can work through the whole kinship networks one by one by you know processing the file. The output consists of a series of individual-level records, it's actually, for those people who are interested in doing this at work these are perhaps very similar to things like parish records or vital statistics, you know you get a parish record that says who's your mother, who's your father, you can find out who your brothers and sisters were. So it's no different.

The analysis we are using is the same analysis that was used to process any record, real life system like that. If we had good records in the real world we wouldn't need microsimulation apart perhaps from forecasting into the future.

So what are the features of this model? Well it's flexible, you know heterogeneity in rates, you can you, you know it's not fixed you can allow variation. You can have behaviour of partners, so sort of mating, you know you have various criteria for choosing partners who are more like you are. You have intergenerational transmission of behaviours and it permits complex questions to be addressed. I mean one application I used was to try to estimate this so called common ancestor of mankind, there's someone out there we are all descended from, that person lived probably only about 1,000 years ago and may well have been Genghis Khan, so we're all probably descended from someone like Genghis Khan so that's, I mean some people think that's counter intuitive that that short time ago that that, you know that's, but this actually, if you like was used in conjunction with other studies to suggest that that is actually a very reasonable ball park figure for the most recent common ancestor mankind. A little bit confined to Eurasian parts of the world which is the great majority of the world's population.

So continuous time model based on a competing risks framework with an event queue formulation and the population rates are updated month by month so you can actually quite, you know precise changes in the parameters to try to model the real world.

There are also limitations with this model, firstly like many simulation models it's both undocumented, unsupported, so it's, you know it's at your own risk model like many of them. It includes minimal covariates at present basically because as

you've got to run this thing up for a couple of hundred years we don't have any covariates in the past anyway, so you know what's the point of having covariates in a model where you have no covariates available to analyse them even if you had it in a model? It requires long-run historical parameters to actually get up to the present day, you can't just step in at the year 2000, you've actually got to go back a long time which is this inter, this reason why there are so few covariates in the model. A run takes approximately 20 minutes with a large-ish sample size, it takes about the same time to process the data to provide usable statistics out of it. So you can't do huge numbers of runs to you know overcome variability, so ... But once you've got the run, I mean any kinship network like that you can simply trace people through however far you want to go out, up, down, into the system, they're all available potentially as long as you spend your time tracking each of these pointers through the various loops to get to where you want. So it gives you if you like an integrated way of looking at any kinship relationship that you want, partnership, children, grandchildren, step second cousins twice removed, whatever.

In terms of the assumptions which I've used, well I've tried to make it reasonably consistent with the past, I mean I've just given a selection of the values around 1950, around 2000, TFR, total fertility rate about 2.4 children per woman in the 1950s, about 1.8 in the present decade, life expectancy going up from men 68 to 80, women 73 to 85, that's a bit high, average age at first marriage again increasing substantially, the proportion of births outside marriage from about 5% to about 40% as we're observing at the moment. Keeping these parameters pretty fixed from now on because things appear to be you know reasonably stable in the recent past but they are at the moment essentially keeping the constant assumptions for the next 40 years or so.

In order to do analysis I just take this list of individuals, I just censor the population at various time points, so you just essentially recreate what you would have observed at some point between 1751 and 2050 and then compute all the appropriate summary measures and then you compare them. So you look at the same population at different points in time.

For each type of relationship you can identify the relevant ego and their kin and the size of populations are given there, they're quite large, so statistical variability isn't an issue, I mean you may want your, lots of variations in your microsimulation model, here we don't, basically it's a nuisance parameter and we want to get rid of it, we've got big enough samples so that our marriage market is reasonable and that the variability is low.

This just shows some comparisons with actual data, these are the simulation models on the right hand side and the corresponding census data for the, essentially the same time point. And even though all that was set up was this simple distribution for 1751 from Wrigley and Schofield and the rates extracted from various, mainly from vital registration data, I mean you can get really quite a close fit in terms of the marital status distribution of the population between the observed and actual values, so it is able to capture the main features of it.

The only thing we have in general about kinship in censuses is whether you're married or not. So in another project we did, we're actually able to collect from data on a range of different kin types, in 1999 and again this just shows a comparison between the model results and the data which were collected in the survey and again there's a, you have a pretty close fit for these. So we felt that this was a reasonably acceptable model which captured the main features of kinship, trends over time, both at a very close level but also at some wide levels as well, they've got grandparents, grandchildren, siblings etc.

So some of the main features of results of the model. Some of the principle trends of say partnership. Well in the sort of North Western European marriage pattern as it's referred to by John Haynall, historically marriage was actually late and high proportions never married. Women born for example around the turn of the 20th century, around 1900, half of them either had no children or only one child, I mean there was a very different sort of pattern, very high rates never married in the 1920s, 1930s, a lot of men killed in the First World War, a lot of men emigrated, a lot of economic reasons for marriage not to take place, whereas the period from 1945 to 1970 had the highest rates of marriage ever experienced in Britain, and then of course followed again by another bust of marriage in the more recent period. Cohabitation has increased but that's insufficient to offset the decline in marriage. So really quite a lot happening in marriage over the 20th century which will impact for example on the availability of partners to people who are now aged let's say 80, and what may happen to that sort of age group in the next 20 or 30 years.

So this just gives a sort of specimen of examples. This is the estimate of the proportion with a current partner on the left hand side, and with a former partner on the right hand side. Well in terms of the sort of current partners, one sees the marriage boom of the 1960s, late 60s, that's the red line, the 75 peaking you know at about age 30, that then shifts, that cohort shifts through and it peaks you know 25 years later in 2000 and it peaks again later for 2025. So high proportions, the highest proportion married or partnered tends to shift, that includes cohabiting as well as married people.

And so over time you know you had this shift in marriage, so by 2050 you might have a very different pattern of people partnered from what was the case now and particularly was the case 25 years ago.

If one looks at former partners, and a huge change. In 1950 very small proportions had a former partner, but by 2050 you might expect something like 40% of people to have a living former partner mainly due to, not only divorce but also to broken cohabitation, so it would mean very different sort of kinship configurations over that time. Well I mean I won't say too much of these, these are just simply summarising those results.

And the second group that one would give a bit of retention to in this context is children and parents. Again one has to look at the history, fertility very particularly low in the 1920s, 1930s, to some extent reflecting the marriage patterns, again 45 to 70 the baby boom corresponding to the marriage boom, again more recently again the baby bust, the decline in fertility, and the increase in extra marital, mainly cohabiting union childbearing, more re-partnering, more incomplete families as they're sometimes called.

I thought I'd just go, take a rather longer term view, so I've extended this analysis back to 1850 and also to you know give in more detail, just to show the changing patterns over time, in terms of the average number of living children people would have had over that 150 year period. So that one finds that the high rates for example peaking around the 40s in the 1950s, but also you know peaking for example end of this purple line 1970 with the baby boom. But at the end, if one gets to the age of 85+ where the demand is greatest, numbers are much much smaller variability in terms of the numbers of living children available to people, partly reflecting changing pattern mortality in children.

If one looks at the natural parents, again a very sharp change over time in that let's say age, around age 40, the proportion of people with living parents or the percentage of living parents, almost the same thing, has more or less doubled over that 150 year period. But I'll go now and return to look at the future as well and push this forward into, you know from now to about 2050 and again one sees that pattern continuing with more, an increasing proportion of people having living parents. I mean one tends to often think about you know do parents have living children, but there's also the question of do children have living parents as well and that has an implication for their living arrangements etc.

So one also sees how the baby boom, how that sharp moving through of that peak from there as it moves through the system, now people have very different experiences you know, who were born different periods apart, you know just summarising that.

One can do exactly the same analysis for grandchildren and grandparents and again one finds that in, for people born around 1950 they might have, at old ages they might expect to have about 5 or 6 living grandchildren average to, it dropped about 3 for the more recent generations and what you might expect to see into the future. But in terms of the number of living grandparents, much more variability. For people born around 1950 at birth they might have expected to have had just over 2 living grandparents, half their grandparents were dead by the time, at birth. By now they expect to have something like 3 ½ living grandparents when a child is born and that, and it's much, far more substantial. If you look at someone aged 25 whether you have a living grandparent or not, the number of living, there's a huge change in that over time.

Average number of ever born living siblings. That's shown you know huge variations over time. I've given, I've shown two things, one is ever born siblings and also living siblings. Even born born, people in 1950 for example who were aged about 80, even people in 1975 they had on average 6 or 7 ever born siblings. That number dropped to just over two for the more recent cohorts. But, perhaps more interestingly, if one looks at the living siblings then they're almost equal, by the time you get to about aged 70 this, the more accessible mortality of the older generations has just about offset the larger numbers, you produce a more, you know very equal numbers of living siblings at the end of the period. This again shows a longer term view of this, it shows that over time from 1850 to 2000 the huge change in terms of people's experience of having siblings over time. This is an artefact this one here because this is the building up from 1751, 100 years is not long

enough to build up the model, you've got to go, you know that's why you need long periods of time but again to point out again over time this great tendency for those things to converge to very similar numbers of living sibs by the time people get to the older ages.

OK, well we can do similar things for things like step children and step parents and how those things might evolve over time. Very sharp increases in the number of people who are step children and the number of people who are step parents. We might expect in years to come something like a third of people will be step children and that peaking at around late adolescence, they will have had, no they will, one of their parents will have re-partnered. And in terms of step parents, again one might expect something like 20% of older generations to be step parents as well.

Well we can also do things like lone mothers and lone children, I don't want to say too much about those, really they are just going through, just showing the large range of options in terms of the different types of kin one might want to pick out of this system and simply tabulate and discuss.

So to other kinship implications. Well these emerging patterns will lead to many more incomplete kin relationships in the past such as step families. Kin relationships are like a more vertical than horizontal, you know there'll be more generations in that direction, fewer kin in the horizontal direction, so called beanpole family sometimes. And the age of a population will have an independent and sometimes reinforcing impact on kin relations. There will be ageing generational relationships, people are having children later, their grandchildren later you know everything is being stretched out. And this has quite important implications, if you think of I mean men tend to have their children later than women. If you think of grandfathers you add 2, you know a couple of years extra on to both those groups it makes quite a big impact whether for example as a 65 year old you have grandchildren or not. I mean these things do tend to impact and you've got to have a model to actually work through these calculations.

So microsimulation is a useful integrated approach to illustrating the full range of family and kinship ties. Some references, and that's it. Thank you.

QUESTIONS

Male question 1 – A couple of things, I actually want to ask quite a lot. Ethnicity one would have thought would be an increasingly important consideration here and you know sort of where the behaviours and interactions occur would be quite different. What's the story there?

Mike Murphy – Well I mean in principle there's no reason not to you know include it for different ethnic groups. You can, there's even an option in the model to allow separate groups and allow them to inter marry and all the rest of it. So in principle, the main problem with this is first, the numbers of ethnic minorities are absolutely tiny, I mean particularly about older people the numbers are, you're talking about absolutely trivial numbers, but also for this model you also would need you know enough run up of parameters to generate the pattern. Now there is no information that gives us for example the average number of children or siblings of ethnic minority people, a lot of them might be leaving/living in the country, so you have no calibration to actually you know, to segregate you have no way of knowing what values you would put in have any validity. For a lot of things you'd have to actually go to the original country and try and to get the parameters of fertility and mortality and partnership and generate those to get the, to run it up, so that would be a sort of huge task to actually get your 2005 ethnic minority population in Britain. I mean it would be a nice idea but the resources would be you know, would be, and I think in practice it just wouldn't be feasible to actually construct a sufficiently defensible set of data to generate those results.

Male question 1 – So lots of work for little value?

Mike Murphy – At the moment yes, I mean I think probably, ??? you'd have to approach it in a different way you know the same as, we don't analyse cohabitation in the same way as marriage because we just don't have the same degree of fine detail in the data and I think it would be the same here, you've got to work with what you've got.

Male question 1 – I had another question or comment was that you said that marriage was the only relationship that you could obtain reliably and I think you said from the census ...?

Mike Murphy – Essentially yes.

Male question 1 – I wasn't sure, I thought in the SARS and certainly things like the BHPS I mean effectively from the household relationships one can tease out parents and children and both of the parents are, or whether the people are married to each other, the parents have had children, I think there'd be quite a lot of valuable information in there for this sort of thing.

Mike Murphy – Yes well I showed the panel who was responsible for the matrix in the census so in a sense there is a lot in there, but we're interested mainly in older people, and of course by definition they're non co-resident with their children and therefore that group I'm afraid you have no information and so yeah in theory you'd consider use own child methods and have been used a number of times, but unfortunately for looking at this particular group they're not, I mean the BHPS is a survey, surveys have some information on a range of services collect information on things like histories, but like indeed a number of other countries do collect such information in census on ever born children and in fact you know a large, particularly Eastern European countries have always collected this information, for some, certain reasons Britain never has since 19, well 1971 was the last time we collected information on fertility histories in the census.

Male question 2 – Is there any spatial segregation or is it just when you say closed system it's just if you're modelling the whole of the UK, it's the whole of the UK?

Mike Murphy – I mean you can, this model, I mean migration is there, you kind of have separate if you like regions, you can allow for interaction you know migration between the regions in the model or you can use those as different ethnic groups. I mean in a sense from a formal point of view it doesn't really matter what you're there, it's just how different groups you allow to interact in various ways. I mean the main problem again is the, getting the data to drive the system at a segregated level when you would need not only fertility mortality partnership in each of the regions, but also all the appropriate transition rates between them for each of the categories. So I think that's ...

Male question 2 – It's just it's a fascinating one from my perspective where visiting friends and family is as important a trip purpose as commuting, it occupies that same level. So having an idea of the separation between families would be an interesting one.

Mike Murphy – Yeah there's some data on, very few data on that, particularly in Britain I'm afraid. Yeah.

Male question 3 – I think the question of proximity from parents was asked one year in the BHPS and the provision of care drops off quite sharply with customers from ...

Mike Murphy – Yes there's a very big internet cross-national consortium called Share Survey of Health, Age and Retirement in Europe and they, I mean for most European countries those data are available and with the US and in fact Japan and Russia are the only 2 major countries that don't actually have this data up. And Britain has got ELSA which does also include some information on proximity of kin as well, so there are some data available on that but they aren't brilliant...

Male question 4 - I think an awful lot of this is determined by education because it's the more highly educated ones that are further away who may be more able to support parents financially, that are less able to support in kind so to speak.

Mike Murphy – Yes I mean it's a necessary but not a sufficient condition to provide informal care, informal family care is that their informal, there are members of the family available. I mean the next, obviously we have to overlay that with what proportion and change of propensity of people to actually you know provide care among those groups. I mean some work has been used applying these sorts of models you know knowing what we do about things like the changing educational composition of the population which again you can make some judgements about, and then using those sorts of parameters in conjunction with these to estimate you know the potential pull of if you like effective carers as well as potential carers.

Male question 4 – I was just going to say I remember reading the thing by biologist Steve Jones saying that the average distance of birthplace to people, I can't remember how long ago, in Oxford was 5 miles, it's now 50 miles, and how it's

actually helped to produce a lot of the genetic, bad genetically inherited diseases because people are now more disparate, you know, it's a wider population.

Mike Murphy – Yeah that's true, I mean I've used, well I mean these models, I mean you can construct kinship coefficients out of these because by definition once you've got the results you can look at that. I mean constant liquidity(?) is still a major factor in terms of say Pakistani groups particularly say in like Bradford, I mean it's a major issue there, so it's still, I mean it's still very much a live issue in public health terms. I mean traveller communities again have very high rates of constant liquidity and the associated birth defects that go with it.

Male question 5 – There seems to be two counter, opposing forces in the model. At the beginning you start with a population of 40,000 so the chances of you marrying somebody that you're already related to are higher than, say you've got a pool of 40,000 to sample rather than out of the millions it was in the 1718. And then, but then on the other hand today you've got 200,000 people if you're not, you're more likely to marry somebody who's vaguely near you right at the other end of the country.

Mike Murphy – Yeah, well first of all in 18, 1751 they're unrelated so there's actually no relationship between them at all.

Paul – I was thinking the next generation down then.

Mike Murphy – Yeah well not, I mean people, everyone gets married you know very quickly because of the rate, if everyone's not married then you ? rates then, and they're still all unrelated, you can only get related by having a common ancestor and so you can only get related down the line when you've actually you know able to trace it back to a common ancestor and then come down the other link. So you can't actually analyse, you can't use these data, you've got to allow enough time for that, the thing to mature. And it turns out, a sort of practical point of view that the, once you get to you know much beyond your four generations, the whole issue of genetic overlap become essentially trivial, you know, it's still you know once you get beyond that, I mean you say the church got it right, perhaps over right in terms of the sort of prohibitions on degrees of relationship but it's actually, I mean it's not a problem in the sense that what you actually get if you include beyond about four generations removed is that it's trivial in terms of let's say the over, the genetic coefficient, the overlap between people is essentially relevant. So it's not a problem.

[END OF RECORDING]