Optometry manpower up to the year 2000 and beyond

Part 2: The future

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In the first part of our report (published in our last issue) after commenting upon the need for a fresh look at the manpower situation, we considered the background to our study and the factors which would enable us to predict the future: the age, sex and number of entrants to optometry; withdrawal rates from the profession; and the calculation of Full-Time Equivalent optometrists. In this concluding part we will be calculating future professional numbers and workloads, and considering their implications and some of the problems involved in predicting the future. (Readers may need to refer to tables and figures printed in the first part of the report)

Previous studies have restricted themselves to looking at specific years and often they have not represented these figures graphically. This handicaps the reader and does not make it easy for him or her to get a feel for, or even a good understanding of, the changes which are being predicted. Tables of figures are all well and good but frequently lack the power to communicate. The probable reason for looking at selected years is simply that previous studies have not made effective use of computers in their predictions. Once a program has been written it is as simple to do the calculations for 30 years as it is to do them for three. The calculations are straightforward and a simple program is not difficult to devise. Anyone with a home computer should not have too much trouble in writing a suitable program, and in fact our first one was written on such a machine. One of the subsidiary aims of this article is to demystify an area of debate and to point out that you do not need to be a statistician, econometrician, computer expert, university lecturer or brain surgeon in order to predict the future needs of the profession!

Naturally, one must proceed with caution. There is an old saying in computing, 'Garbage in — garbage out!' and if you make unsound assumptions then your conclusions will be at fault, however good your program. We should also add that computer results frequently carry with them a spurious air of authority. While it is true that computer calculations usually reduce errors they should not be treated with too much reverence.

We have made our assumptions as explicitly as we could — as have others. It is unlikely that every reader will agree with all our assumptions and we invite those who are interested to produce their own computer model and simulate the future changes in the profession. If the future is continuously monitored there will be little chance of the profession being caught unaware. Clearly, no one wants to see a position where there are too many OOs or where *sudden* changes to recruitment must be introduced. Wherever possible we think we would all prefer to see gradual change.

Figure 8 shows a simplified flow diagram for a program to carry out these computations.

Future professional numbers

The number of OOs on the Register has been calculated for each year until the year 2000 and beyond. We have taken 1982 as our base year and assumed that the number of UK ophthalmic opticians entering the profession after training in UK institutions between 1983 and 1986 would be 240, 240, 240 and 230. From 1987 we have assumed that there will be 225 registering each year with the age distribution shown in Table 2. For the sex ratios we have taken the appropriate values in Figure 5 and from 1987 onwards we have assumed there will be 55 per cent women. We have also repeated the calculations for extreme cases of (i) 250 entrants per year, 50 per cent men and (ii) 200 entrants, 40 per cent men. The results are shown in Figure 7. (See Part 1.)

Our main prediction gives us a curve which reaches almost 7,500 OOs on the Register by the year 2000. The two extremes give a range of 7,095 to 7,772. If recruitment were maintained unchanged the Register would reach a steady state of almost 9,400 well into the 21st Century.

It was not felt possible to predict the number of OOs on the FPC lists. Instead we calculated what we considered to be a measure of available full-time manpower — the number of OOs under 65 adjusted for those women with a family commitment. Our calculations continued the curve for the years 1973 to 1982. Two hundred and twenty-five entrants from 1987 onwards results in 6,298 such optometrists by 2000, with 200 and 250 giving 5,972 and 6,632. The ultimate under-65 manpower for our median prediction was 7,602 in the 21st Century.

The Full-Time Equivalent curve calculated according to Table 4 departs from the path of the under-65 curve and rises to give 5,584 FTE optometrists by the year 2000, with 5,893 to 5,287 for the extreme assumptions. The median ultimate figure was 6,729. We have summarised the figures which are possibly the most important in Table 5. They can be compared with 1982's 4,797 FTEs.

It seems important to us to pay particular attention to the way that the predictions of ophthalmic opticians on the Register and FTE OOs tend to diverge. This is largely a consequence of the increasing proportion of women, but we feel that not everyone may have appreciated how large the difference

Table 5. - Full-Time Equivalent optometrists in the year 2000

Proportion of men in intakes	Annual number of new home registrations		
	250	225	200
50	5893	5640	5387
45	5830	5584	5337
40	5768	5527	5287

The table predicts the number of Full-Time Equivalent optometrists in the year 2000 as a consequence of the size of the annual recruitment from the UK training institutions and the proportion of men. The prediction favoured 6y the authors is 5584 FTE optometrists, while the 1981 figure was 4,797.

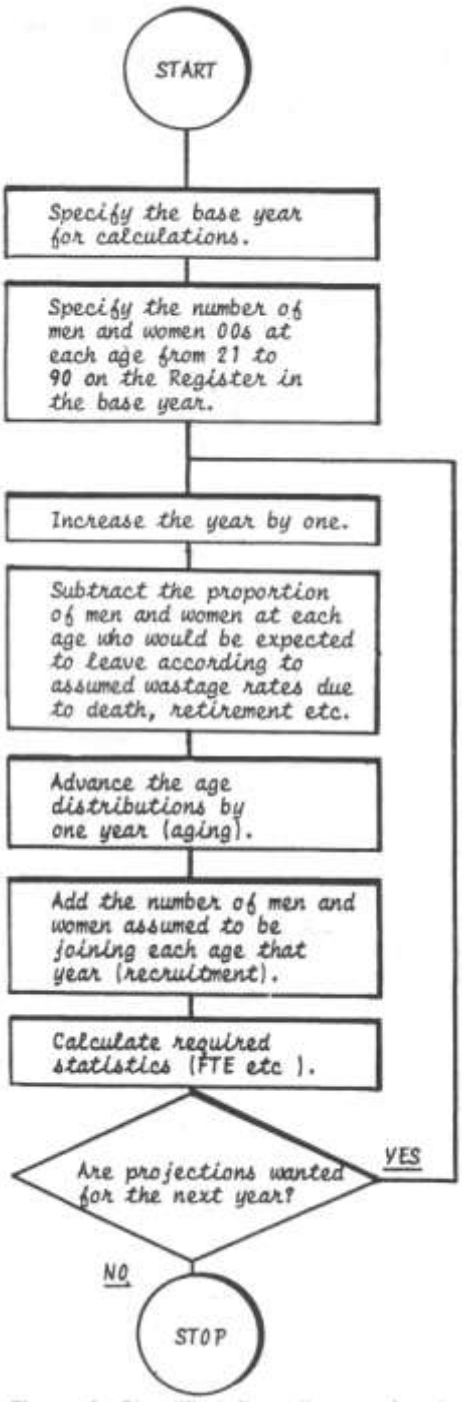


Figure 8: Simplified flow diagram for the calculation of the projections

between these statistics will become. Bennett (1978) commented upon the constancy of the FTE figure expressed as a percentage of the GOC total in the late '70s. Our projections indicate that this ratio will decline slightly from 79 per cent in 1982 to 75 per cent by the year 2000, when it will represent a difference of almost 2,000 optometrists. Clearly, the calculation of Full-Time Equivalents will continue to assume great importance, but in order to interpret the significance of these graphs in a sensible fashion we need to see what implications they have for sight test figures.

Figure 9 shows histograms for the ages of male and female ophthalmic opticians projected for the years 2000 and 2030. On our present assumptions we would expect the number of females to exceed that of males by the year 2013, while by 2000 it would represent 43 per cent of the registration total (Bolt, 1983, predicts 40 per cent females amongst British-born doctors by 2000).

Annual number of sight tests

Not all sight tests and eye examinations are recorded in the official statistics. Sight tests not carried out under the General Ophthalmic Service include those in hospitals and schools and those carried out privately.

Sight tests paid for under the GOS are recorded in a number of sources which do not always agree with each other precisely. The latest editions of those consulted are given in the reference list. Breakdowns of sight tests into those carried out by OOs and those by OMPs are given for England by the DHSS (eg, 1982), Wales by the Welsh Office (eg, 1980), Scotland by the Information Division of the Common Services Agency for the Scottish Health Service (eg, 1980) and Northern Ireland by the Central Service

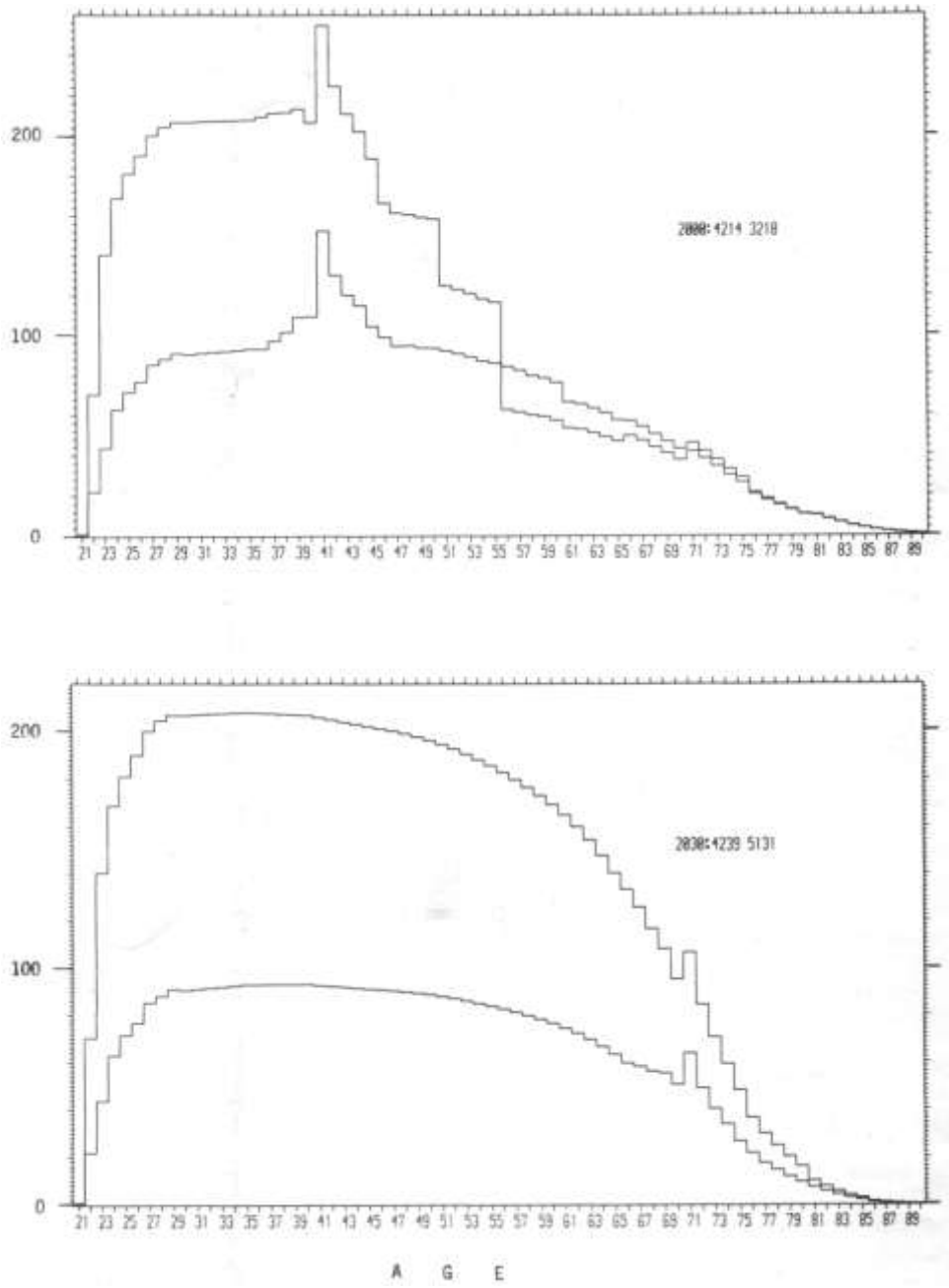
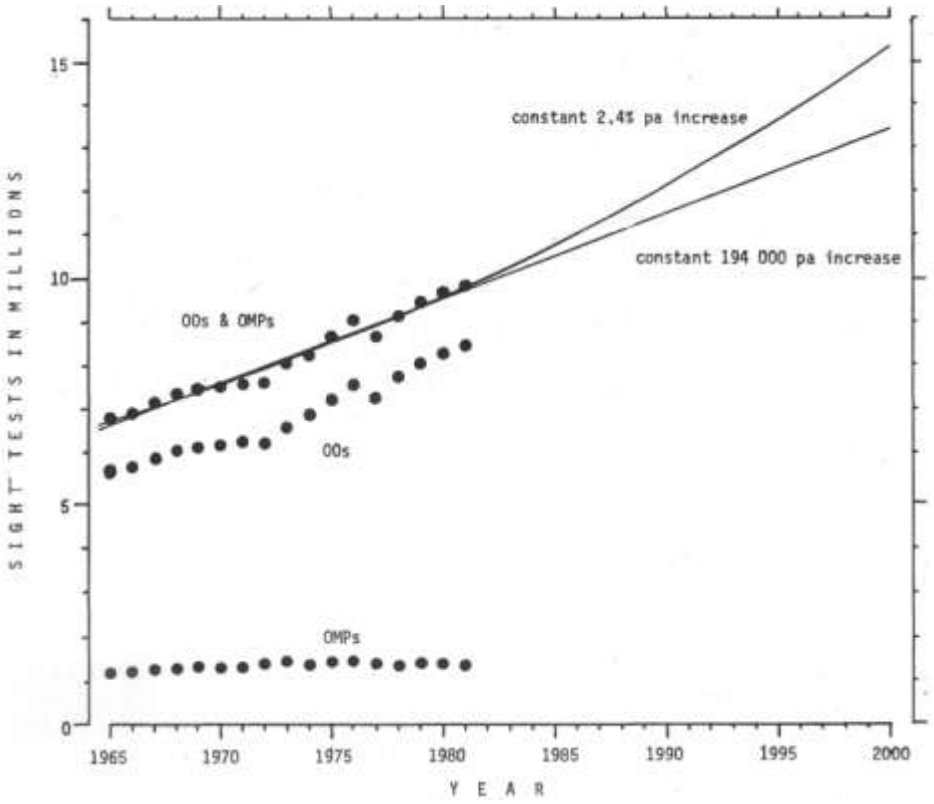


Figure 9: Age histograms for optometrists in the years 2000 and 2030

The projected age distributions have assumed intakes of 225 new optometrists each year (55 per cent female). The upper line in each histogram gives the frequencies for men and women combined, while the lower line is for men only Frequencies are for one year age-bands and the totals for men and women are given. The precise position of the peak (shown at 41 years of age in the 2000 histogram) cannot be known-as GOC age data is recorded in five year age-bands

Figure 10: Annual NHS sight tests



The series of points plotted at the top show the total number of sight tests paid for by the Executive and carried out annually in the UK (England, Wales, Scotland and Northern Ireland) by both OOs and OMPs up to the year 1981 under the General Ophthalmic Service. The lines represent two best-fit curves extrapolated to the year 2000. The upper projection is *exponential* and corresponds to a constant annual percentage increase of 2.4 per cent, while the lower projection is less radical and assumes a *linear* increase corresponding to a constant annual increase of 193,740 sight tests and is equivalent to a 2.0 per cent rise in 1980 reducing to .1.4 per cent in 2000. Data is also presented for UK sight tests according to whether they were carried out by OOs or OMPs

These projected increases seem sensible if we assume that in the future people are going to be more health-care conscious, but not too much should be read into the *precise* predictions. The UK population is itself projected to increase from some 56 million in 1981 to 58.4 million in 2001 (CSO, 1983). This is equivalent to an average annual rise of less than 0.2 per cent and thus clearly population changes are unlikely themselves to be a major component in the projected sight test increase described. It is also clear that people will be living longer and the proportion of elderly people in the community will continue to rise. But sooner or later one would expect the number of sight tests per annum to begin to approach a level of saturation for society. Clearly, exponential and even linear increases cannot continue indefinitely.

At some time in the future increases will slow down and the sight test curve will flatten out, although probably not before economic and other factors have injected a few kinks and wobbles into it that no mathematical model can fit or predict.

At present over half the adult population uses contact lenses or spectacles and the average interval between sight tests has been estimated at just under three years (FOCB, 1982). Very simple arithmetic suggests that the type of increases being discussed for the year 2000 would involve decreasing the average interval between sight tests to 21 to 26 months if there were no increase in the number of patients, or somewhat longer if more people took to having their eyes

Agency (eg, 1982).

Figure 10 shows the UK sight test totals for the years 1965 to 1980. If we consider the underlying process here as a constant percentage increase then we come up with an annual figure of 2.4 per cent per annum. This gives us the gently increasing curve which is similar to Alpine and Jack's (1979) median 2.6 per cent p.a. projection. By the year 2000 this graph has reached 15.4 million sight tests to be carried out by UK OMPs and OOs.

Alpine and Jack also considered the possibility of a 5 per cent annual increase, but we saw no reason for this and therefore have not considered it. Bennett (1978) also regarded it as unrealistic. Of course, the idea of a constant *percentage* increase itself may not be sensible. It is just as possible that what we have here might equally be approximated in the long term by a straight line, equivalent to a constant annual increase in the *number* of sight tests. If this were so then we would obtain the straight line shown in Figure 10. This gives us 13.4 million UK sight tests in the year 2000 and represents a 2.0 per cent p.a. increase in 1980 declining to 1.4 per cent p.a. in 2000. It is possible to fit exponential curves and straight lines to the other major annual statistics — sight tests by OOs and OMPs in Great Britain (Northern Ireland excluded), and sight tests by OOs alone in the UK or Great Britain — and if we do this we obtain the further equations and predictions

Table 6. - Best fit equations for predicting annual number of sight tests

population	equation		annual increase	year 2000
UK OOs and OMPs	exponential:	$y = 6.74 \times 1.0239^{x-1965}$	2.4%	15.4m
	linear:	$y = 0.19349x - 373$	2.0% reducing to 1.4%	13.4m
GB OOs and OMPS	exponential:	$y = 6.60 \times 1.0241^{x-1965}$	2.4%	15.2m
	linear:	$y = 0.19196x - 370.69$	2.0% reducing to 1.5%	13.2m
UK OOs alone	exponential:	$y = 5.47 \times 1.0269^{x-1965}$	2.7%	13.9m
	linear:	$y = 0.18271x - 353.66$	2.3% reducing to 1.6%	11.8m
GB OOs alone	exponential:	$y = 5.34 \times 1.0272^{x-1965}$	2.7%	13.7m
	linear:	$y = 0.18071x - 349.87$	2.3% reducing to 1.6%	11.6m

Alpine and Jack (1979) analysed the 1971-1978 UK data, assumed an exponential growth trend in sight tests and came up with an annual increase of 2.6 per cent. We have based our analyses on the data for the years 1965 until 1981. In the equations *y* represents the number of annual sight tests in millions while *x* represents the year. The annual increase is a constant value for the exponential equations, while for the linear ones a percentage annual increase is given for the years 1980 and 2000. Predictions of sight tests in millions are given for the year 2000.

summarised in Table 6. It is worth noting that these projections are not too incompatible but the projection for the UK and both OOs and OMPs remains of prime importance as it is the only statistic which assesses the whole community's total demand for eye-care services[7].

[7]It is said that Northern Ireland figures distort the picture a little because of the relatively small proportion of sight tests carried out there by OMPs under the GOS (Office of Fair Trading, 1982), but it must be remembered that NI sight tests account for less than 2 per cent of the UK total.

examined. Intervals of the order of two years would not appear to be too short for society in general.

Another way of approaching the problem is to try and look at the fundamental and potential *need* for sight tests and eye examinations. Writing in 1974 the EIU suggested '(a) that children under 16 years of age are examined three times while at school, at 5,10 and 14 years old; (b) that in the group of 17 to 49 year-olds, 50 per cent of whom are non-spectacle wearers, who are examined at 10-year intervals — at 27, 37 and 47 years — and the other 50 per cent are spectacle

wearers, who are examined at three-year intervals, at 17, 20, 23 and so on up to 47 years; (c) that of the over-50's, 33 per cent are examined every 5 years, at 50, 55, 60 and so on, and the remaining 66 per cent every 2 years at 50,52 and so on'. They calculated that this meant 15 million sight tests according to 1973 population figures and a projected 15.7 million in 1983. They noted that the 1973 figure was approximately double the actual number of tests but considered that such targets demonstrated the great potential for improved eye care. It now appears that by 1983, the number of sight tests will have exceeded 10 million but still be well short of their 15.7 million target. According to our own calculations using the EIU's formula and more recent population projections for the United Kingdom (OPCS, 1980) one obtains potential targets of 15.7 million in 1980, 15.8 in 1990, 15.9 in 2001, 16.4 in 2011 and 16.9 in 2018. Our exponential growth curve would reach these levels by 2002, while our linear projection would not broach the potential until 2018. These considerations seem to us to argue against considering any extrapolation of the sight test figures significantly below the linear curve in Figure 10, at least not before 2000.

Sight tests per practitioner

In calculating our projections for UK sight tests shown in Figure 10 we did not distinguish between OMP and OO sight tests. We have no information on likely changes in OMP numbers in the future. Figure 7 shows little change in the past with the number of OMPs on the FPC lists varying between 900 and 1000, with perhaps a central tendency around 950 in recent years. Ophthalmic medical practitioners are doctors qualified in ophthalmology who may have the Diploma in Ophthalmology (DO), Diploma in Ophthalmic Medicine and Surgery (DOMS), or Fellowship of the Royal College of Surgeons (FRCS); but not all qualified OMPs practise each year under the GOS, although the National Ophthalmic Treatment Board Association has no current, valid statistics. (It is said there are 1400 qualified doctors working in ophthalmology: FOCB, 1982.)

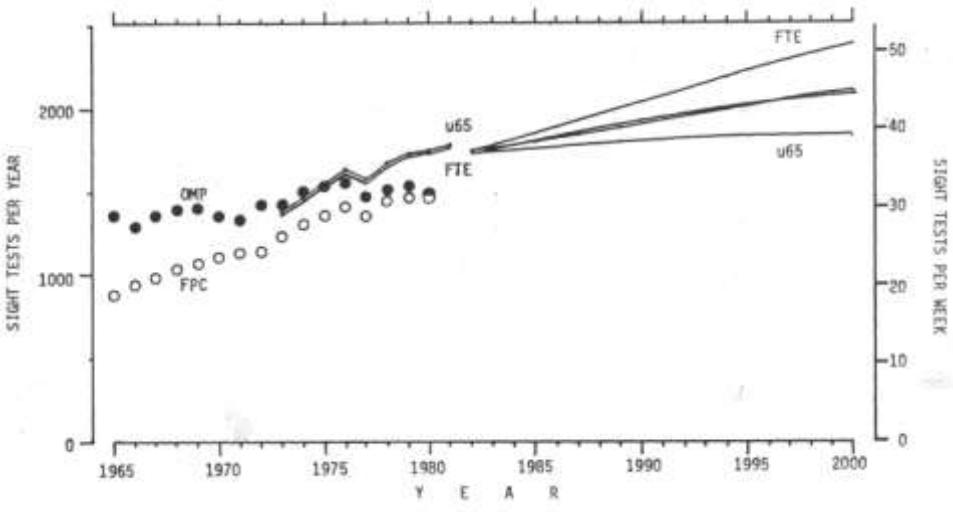
There also appears to be little change in the number of sight tests by OMPs (Figure 10), but when we look at sight tests per OMP (Figure 11) we find that there has been an increasing trend from 1965 to 1980. The increase is not as great as that for the equivalent OO statistic (sight tests per OO on FPC list), but then the latter has a lower starting point. While it appears sensible to concentrate on the projection of UK *total* sight test figures including those by both OOs and OMPs, it is not obvious in what way these projected numbers should be divided up between the two groups of professionals in the future. Should we assume common future trends for both or should we assume that OMP activity rates will remain unchanged?

We decided to assume that future numbers of OMPs would remain around 950, and that the number of sight tests per available OO under 65 would be matched by the number of sight tests per OMP on the FPC lists. There has in the past been some similarity between the two statistics (see Figure 11 - u65 and OMP) but at present they are diverged. Thus, we have divided up the projected number of sight tests between OOs and OMPs in the ratio of FPC OMP numbers (assumed to be a constant 950) and the predicted number of OOs available full-time and under 65 years of age, before calculating the various sight test loads per practitioner. This gives OMPs just over 16 per cent of the 1982 sight tests, reducing to 13 per cent in the year 2000, whereas their actual proportion for 1981 was in fact 14 per cent. Had we simply divided up the sight tests according to the best-fit projections summarised in Table 6 then we might have assigned 1.5 million to OMPs in 2000 (10 or 11 per cent), but we feel this would be a rather naive way to treat these equations. Although our division is unsatisfactory in the short term because of the discontinuity it introduces between 1981 and 1982 (see Figure 11), we feel it has credibility and value for the longer term.

In Figure 11 we present projections for sight tests per FTE[8] optometrist and per OO under 65. For each statistic we show two curves here - the upper assumes the already-discussed exponential increase while the lower assumes the linear increase. The curves presented are for annual recruitments of 225, 55 per cent female. We have summarised the position in the year 2000 in Table 7. It is interesting to note how small the effect of varying the sex ratio is on the sight test figures — a 5 per cent variation either way will not have a great effect between 1987 and 2000. Our main projection is that the average full-time optometrist will be carrying out between 44 and 51 sight tests each week.

It is particularly interesting to consider

Figure 11: NHS sight tests per practitioner



The scale on the left indicates the annual number of sight tests per practitioner, while that on the right gives the weekly number, assuming a 47-week working year. The black circles give the average number of sight tests carried out by ophthalmic medical practitioners on FPC lists under the General Ophthalmic Service, while the open circles give the corresponding statistic for FPC ophthalmic opticians. For both groups the figures are based on UK sight tests from 1965 until 1981 (England, Wales, Scotland and Northern Ireland). The two line graphs for the years 1973 to 1981 give the total number of OO sight tests divided by the number of Full-Time Equivalent OOs (FTE) and the number of OOs under 65 years of age (u65) as shown in Figure 7. The FTE curve indicates the number of sight tests predicted to be carried out by the average, full-time OO as conceived by Alpine, whereas the lower, u65 curve shows the number of tests which would be needed to be carried out on average by an OO if every optometrist retired by the age of 65. They virtually coincide between the years 1973 and 1981, but it should be noted that the slope of both curves has been exaggerated by our not distinguishing between chemist and non-chemist opticians, a classification dropped by the GOC in their annual report for the year 1977. Both the FTE and u65 curves have been extrapolated to the year 2000 according to the computer model discussed in the article, assuming 225 new UK-trained registrations (55 per cent female). For each there are two projections — the upper in each pair assumes an exponential increase in sight tests while the lower assumes a linear one. The linear-FTE and exponential-u65 curves are very close. Alpine (1970) calculated the number of sight tests per FTE optometrist at 26 per week in 1969

Table 7. - Weekly sight tests per FTE

Proportion of men in intakes	Annual number of new home registrations		
	250	225	200
50	42-49	44-50	46-52
45	43-49	44-51	46-53
40	43-50	45-51	47-53

optometrist in the year 2000

The table predicts the average number of sight tests a full-time ophthalmic optician would be expected to carry out in the year 2000 as a consequence of the annual recruitment number from UK training institutions and its proportion of men. For each of the nine combinations there are two figures. The smaller one assumes a linear increase in sight test numbers, while the larger assumes an exponential increase. The prediction preferred by the authors is 44 to 51 sight tests per week, while the actual figure for 1981 was 38.

[8]FTE figures make no explicit allowance for the small numbers of OOs who exclusively do contact lens work, administration or teaching, or those who practise exclusively outside the GOS; but perhaps there is an implicit allowance.

these projections in the light of what is known about the work patterns of today's graduates. In an earlier study (French, *et al*, 1981) it was found that graduates who did not do their own dispensing, but who worked full-time, allowed an average 27 minutes for a sight test and eye examination and carried out 47 sight tests in an average week. (Over half allowed 30 minutes for a sight test with a quarter allowing just 20 minutes. The median and modal number of tests were higher at 55 and 65 per week, respectively.) Amongst those who did their own dispensing, the average time allowed per patient was 40 minutes with an average of 41 tests per week (Modal times were 45 minutes by just under a half and 30 minutes by almost a quarter with a modal frequency of 50 per week). The average activity for the two groups combined was 47 sight tests per week. Clearly, the levels projected for 2000 are well within the compass and current experience of the younger generation of today's optometrists.

In Figure 12 we present our projections to the year 2030. This is rather optimistic in the sense that all our assumptions are unlikely to be vindicated, but in so far as our assumptions represent the most likely view of the future at this moment in time it represents a legitimate piece of crystal-ball gazing. School children considering whether to apply for optometry and the applicants themselves constantly ask about the profession's future. The youngest recruits to degree courses in 1983 may be retiring in 2031. Their future will *not* be precisely like this but it is the best guess we can make today.

After the year 2000 the exponential projections depart more markedly from the linear ones. We asserted earlier that growth in sight tests could not continue indefinitely and that sooner or later a saturation point would be reached. Using the EIU (1974) formula we calculated that their potential targets would be reached in 2002 by exponential growth and 2018 by linear increases. This emphasises that the curves beyond these respective points should be regarded with particular suspicion.

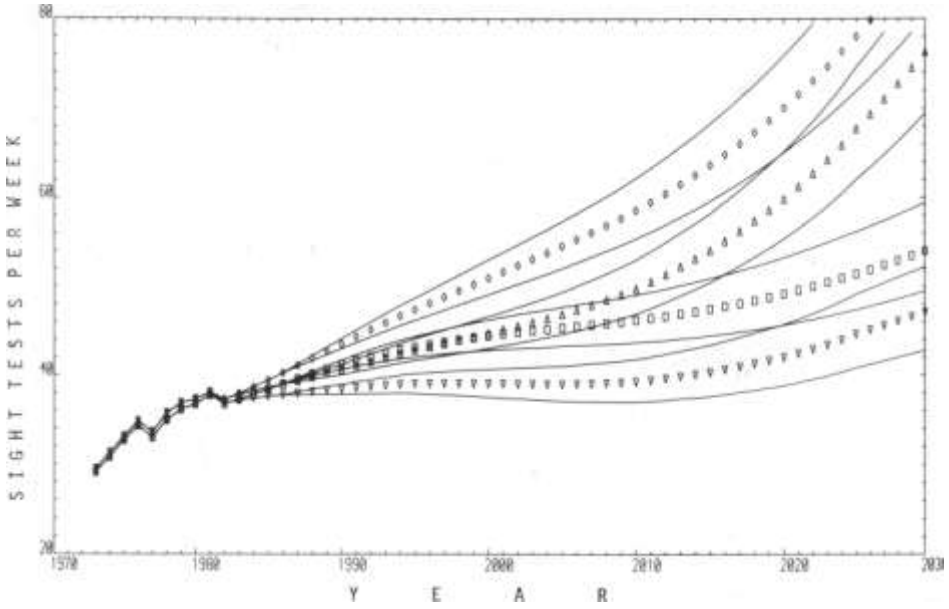
Expectations of working life

A particularly direct way of looking at an individual's future is to estimate the number of years of working life that they can be expected to look forward to. We cannot use the withdrawal rates shown in Figure 6 for this purpose, unchanged, as the rates under the age of 50 represent the results of a net migration, amongst the population and not the behaviour of an individual. On the other hand, if we were to use the mortality rates for this period of time we would probably not allow for those optometrists leaving the profession. We have, therefore, carried out the calculations using both sets of assumptions and suggest that the true result will lie between the two. The results are shown in Figure 13 and indicate that on our model a 21-year-old registered ophthalmic optician would be looking forward to 44-47 years of work as an optician (arithmetic mean), and a 50-year-old to 20 years.

We can take this analysis a stage further to see how many FTE years that an optometrist might be expected to work using the weights described in Table 4. The results are also shown in Figure 13 with separate graphs for men and women. Women are projected to contribute a smaller, effective number of years on GOS work. The age distribution shown in Table 3 enables us to calculate the average working life and average FTE working life of recruits entering the profession today.

Because female entrants tend to be younger than the male, we find that their expected working life is marginally longer; 42 to 44 years compared with 41 to 43. But the FTE expected working life of women is substantially shorter at 25 to 26 years compared with 36 to 38 for men.

Figure 12: Sight tests per practitioner to the year 2030



There are four sets of curves here. The symbols are concerned with the median projection (225 new recruits per year) while the lines are concerned with the extreme projections (250 or 200). All graphs assume 55 per cent female intakes, but as Table 7 indicates the graphs for 50 and 60 per cent female intakes do not differ markedly up to the year 2000 and have been omitted. The top set (O) assumes a continued exponential increase in the number of sight tests and gives the predicted number of sight tests for an average full-time (FTE) optometrist. The set marked with the rectangle symbol (n) gives similar predictions but this time assuming a continued, linear increase. The upright triangle symbol (A) gives the number of sight tests per ophthalmic optician under the age of 65 adjusted to allow for commitments to children and assuming a continued exponential growth in sight tests. The inverted triangle (V) gives the corresponding results but assuming a continued, linear growth

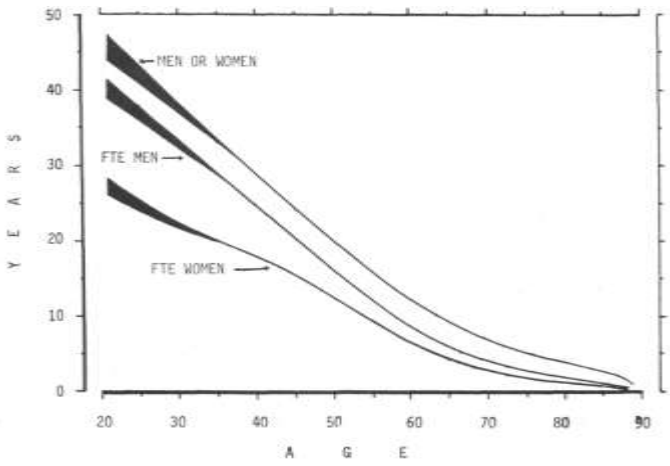
Discussion

It seems to us from our projections, particularly those for sight tests per Full-Time-Equivalent optometrist, that current recruitment numbers are about right. Any increase would surely be ill-advised and lead eventually to a situation where too many practitioners would be chasing too few patients. Equally, a marked decrease could all too easily result in the continuance of a decline in the Full-Time Equivalent numbers for the United Kingdom. To plan for a steady increase in sight tests per FTE OO seems sensible. There has been a continued increase up to the present (Figure 11) made possible, among other factors, by a doubling in the number of dispensing opticians in little more than a decade (GOC, 1983).

Of course, there are many features of the future which it is impossible at this time to quantify, and we hope that decisions made today will enable the future development of the profession to occur without handicap. Nobody would want to see a situation occurring where it was suddenly discovered that there were too few or too many OOs.

It is possible that in the future 'job-sharing', where two people do what today is considered one person's job, will become more widespread and accepted. Recently a BMA discussion document (Bolt, 1983) has prompted suggestions of a need for a cutback in recruitment to medicine in order to prevent there being a 30,000 excess of doctors in the year 2000, unless new jobs can be provided for them. The report comments that it is impossible to guarantee a smooth progression from 1983 to 2000. Even today there is an employment problem for general medical practitioners and job-sharing has been proposed as a part solution. Clearly, such a change could effectively double employment and halve the work load in any area that it was adopted. The problem for medicine is made even more complex by the large number of overseas doctors who practise in this country and the potential problem from the EEC where it would July 2, 1983 The Ophthalmic Optician

Figure 13: Expected working lives of



The topmost of the three graphs gives the number of years that an ophthalmic optician is expected to continue working as a function of their age using the assumptions of the computer model discussed. The two other graphs give the number of Full-Time Equivalent years that a male or female optometrist would be expected to work with their working time adjusted according to the FTE weights described in Table 4. The average working life expected of 1982 entrants to the profession was 41 to 43 years for men and 42 to 44 years for women. Expected FTE years were 36 to 38 for men and 25 to 26 for women. The equivocation in these figures and the graphs at younger ages results from the *two* methods used in calculating the results. With one we used *the* withdrawal rates described by the dotted line in Figure 6, while with the other we modified the withdrawal rates for the under 45s to equal the male mortality rates. The true result lies somewhere between the two

appear that too many doctors are also being produced.

Ophthalmic opticians do not work in a vacuum and practices which are widespread in other areas might be expected to influence optometry, but there is a more direct effect which might occur if unemployment became a serious problem in medicine. More doctors might choose to qualify as OMPs and this together with the increased number of dispensing opticians who are being trained could upset the most careful calculation of any future professional changes. An increase in the number of OMPs from the present level of 950 could have radical consequences, and it is important to remember that the United Kingdom has relatively few ophthalmologists at present, a point noted by the Office of Fair Trading report. In the United States, for example, 43 per cent of sight tests are carried out by ophthalmologists, compared with 15 per cent in this country (OFT, 1982).

Another possible response to a falling number of jobs is an earlier retirement age. So far, the GOC figures (Figure 1) make it clear that for many optometrists the age of 65 is of little significance and it would be interesting to see whether they would also ignore an earlier landmark if it was instituted. If the proportion of self-employed OOs decreases one would expect to see more retirements at the normal age. In medicine there is a trend towards earlier retirement and Bolt (1983) has suggested all doctors will have retired by the age of 65 in 2000[9].

A shorter working week and longer holidays are all trends which people anticipate in other areas of work and one wonders whether any professions, including ophthalmic optics, can remain exceptions.

Advertising is another development which has been discussed a great deal of late. The Office of Fair Trading (1982) suggests that this would stimulate an increased demand for sight testing, presumably enabling the levels of activity calculated from the EIU formula to be reached more quickly.

Technological advance has always been in the foreground of attention, but so far such changes have had little effect on the ophthalmic optician's pattern of work. That the impact will eventually be substantial would seem impossible to deny. One would presume that more sophisticated instruments will enable an optometrist to carry out an equally comprehensive examination in a shorter time and/or provide for more extensive consultations. Such developments would need the support of more mid-career training (particularly for those who have qualified some years before) and probably encouragement from the College in the form of post-registration qualifications. It is gratifying to note that these aims are being pursued today; for example in the form of the proposed Fellowship examination.

Perhaps it is just too much to expect that any planning can encompass all such changes, and optometry is not the only profession which will have to face up to such uncertainties. The toothpaste advertisements promise us that dentists are looking forward to the day of 'zero fillings for all' but they do not tell us how that profession will be coping with this change. The development of cheap, effective, microcomputer-based medical diagnosis must surely be only just around the corner. The beginning of 1983 has seen advertisements announcing 'the world's first home doctor program' for your home micro. Obviously, such programs are no more a threat to your GP than a medical dictionary, but how long will it be before tools such as this reach a degree of sophistication which warrants the attention and concern of the medical profession? Eventually, intelligent software will enable a general practitioner to carry out his work more efficiently and quickly.

Conclusions

Perhaps the weakest part of our analysis is its reliance upon FTE weights which are basically 14 years old, and we hope the profession will remedy this matter because-the figures are of vital importance. It would also be useful if the progress of overseas degree students was carefully monitored to see what numbers enter, register and return home. At present, home and overseas students are not always distinguished in official statistics and this makes precise observation of registration changes impossible.

We suggest that UK optometric manpower is 'on target' for the year 2000, although beyond then no one can be too definite. This depth of view is probably satisfactory for the over-40s but younger members of the profession will be seeking further assurances. We have tried to provide the facts to enable them to draw their own conclusions. Will any profession exist without radical alteration beyond the year 2000? Will the very structure of society remain in its present form? We do not pretend to know all the answers but suggest that the profession has a particular responsibility and obligation to the younger members of the profession and their futures[10], and must carefully weigh the consequences of its actions.

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Table 8. - Age distribution of ophthalmic medical practitioners

age group	men	women
-29	8	3
30-39	146	34
40-49	232	35
50-59	149	31
60-64	48	12
65-69	78	8
70+	93	3
all	754	126

[9]As with OOs there are substantial numbers of general practitioners over 65 years of age. Compulsory retirement does not appear to brave been seriously suggested, but one response to the 1981 Acheson Report on improving GP services in inner-city areas has been the proposal by the Shadow Health Minister that financial inducements should be offered to encourage retirement of GPs over the age of 70 in order to make room for younger doctors. According to the BMA there were 1500 unemployed doctors last year.

[10]A detailed print out of our various projections to the year 2050 is available on microfiche to anyone who sends a stamped, self-addressed envelope (^. 110mm x 160mm) to Chris French, Ophthalmic Optics Department, UMIST, PO Box 88, Manchester, M60 1QD. A free listing is also available for a Basic program written for the 48K Sinclair Spectrum micro with printer. This simulates the changes in the profession from 1982 onwards; producing yearly age/sex histograms, and predicting sight tests per FTE OO per week according to three different assumptions about OMP activity rates. The user is asked for two numbers, annual intake and proportion of women, while the program does the rest.

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Postscript

Since the article was written we have been able to obtain details of the age and sex of English and Welsh OMPs, by courtesy of Mr Gosling of the DHSS in London. This information does not appear to have been published before. For those on FPC lists as of December 31, 1981, 14 per cent were women and 7 per cent also acted as general medical practitioners. The age distribution is quite different from that of OOs in that, as expected, there are very few OMPs under the age of 30. The largest group is composed of those in their 40s, but it is interesting to note that there are quite a few aged 70 or over. We were surprised to find that 21 per cent of OMPs are past the normal retirement age of 65, a figure very similar to that for the corresponding proportion of OOs on the GOC Register. Details are shown in Table 8. This late information suggests a more rational division of UK sight tests between OOs and OMPs — in the ratio of predicted FPC OOs to 950. Between 1973 and 1982, FPC OO numbers have varied between 91 and 93 per cent of the GOC total. We have taken the 92 per cent proportion and used it to recalculate the figures given in Table 7 and re-draw the graphs shown in Figure 12. The graphs (not shown) are very similar indeed and are enhanced by the removal of the 1981-1982 kink, while the sight tests per FTE OO per week in 2000 are almost identical (one per cent higher).

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