IN SEARCH OF THE ELUSIVE FEMALE ACTUARY

by Shivani Ramjee, Felicia Sibiya and Kathryn Dreyer

Presented at the Actuarial Society of South Africa’s 2011 Convention
8–9 November 2011, Sandton Convention Centre, Johannesburg

ABSTRACT
The aim of this paper is to establish the current level of participation of women in the South African actuarial profession and to contextualise the gender status of the profession, both historically and relative to elsewhere in the world. We investigate the extent to which women are represented in different age groups and at various stages of the qualification process. We find that 85% of Fellow members of the Actuarial Society in 2010 are male but that women have greater representation amongst student members and younger cohorts. Given that people primarily enter the profession from undergraduate degrees in actuarial science we analyse the relative performance of female students enrolling for an Actuarial Science degree at the University of Cape Town. We find that the proportion of female entrants has increased over time but that persistency rates for female students are lower than for male students. We identify the need for further research to establish the underlying reasons for the male-dominated nature of the profession and recommend that universities, actuarial employers and the profession actively seek to improve the perception of the profession and the experiences of women in the classroom and workplace.

KEYWORDS
Actuarial science; exemption rates; gender diversity; persistency

CONTACT DETAILS
Shivani Ramjee, School of Management Studies, University of Cape Town, Private Bag, Rondebosch, 7701. Tel: +27(0)21 650 2478; Email: shivani.ramjee@uct.ac.za
1. INTRODUCTION

The actuarial profession in South Africa is relatively small with 910 Fellow members and 1 305 Student members (Actuarial Society of South Africa, 2010). The South African profession is male dominated: only 15% of Fellow members were female in 2010. The Australian actuarial profession reported similar figures in 2002 (17% female) (Howes, 2002), as did the UK profession in 2006 (19% female) (De Valois, 2007). By comparison 37% of all managers and professionals in South Africa are female1 (Statistics South Africa, 2011).

The aim of this paper is to provide a starting point for research efforts to improve the gender diversity of the South African actuarial profession. The paper sets out to establish the current level of participation of women in the actuarial profession and to contextualise the gender diversity status of the profession.

The participation of women in the profession has importance for both the Actuarial Society and actuarial employers. In order for the actuarial profession to remain relevant it needs to become more representative of South African society. Actuarial employers face the demands of employment equity legislation as well as specific targets for the participation of black2 women in the financial services industry as set out by the Financial Services Charter (Financial Sector Charter Council, 2004). There is a global trend towards quotas for women’s representation on boards of directors (Hewlett, 2011) and increasing evidence that gender diversity has a positive impact on corporate performance (Desvaux, Devillard, & Sancier-Sultan, 2010; Joy et al., 2007).

In order to ascertain the extent to which women participate in the actuarial profession we examine the number of women attracted into the profession, the relative performance of male and female students at university and in the professional examinations, and the persistency of female students through the qualification process.

We had data from only one university actuarial programme which is a limitation of the research. The scope of the paper does not extend to explaining the underlying reasons for differentials in attraction, retention and performance but aims to stimulate thinking and to provide a base for further research by providing a snapshot of the current situation.

We begin, in Section 2, by providing a brief history of gender diversity in the actuarial profession as a means of establishing the context. In Section 3 we analyse the gender profile of new entrants to the actuarial science programme at the University of Cape Town (UCT). In Section 4 we examine the relative performance of female students in Actuarial Science at UCT using the rates of persistency and the numbers of exemptions obtained from professional examinations as measures of academic success. In section 5 we discuss the relative performance of male and female students in the

---

1 The figure for professionals includes nurses and teachers, both of which are typically characterised as female professions.
2 The Financial Services Charter defines black people as all Africans, Coloureds and Indians who are South African citizens.
professional examinations and analyse the profile of the profession by age and category of membership. In section 6 we discuss recommendations for further research.

2. A BRIEF HISTORY OF GENDER DIVERSITY IN THE ACTUARIAL PROFESSION

Women have had a relatively short history in the South African actuarial profession. The first woman to qualify as an actuary in South Africa was Pat Potgieter (née Wood) in 1955 (Els, 2009). At the same time women made up 1% of the UK profession (Bellis, 1996). The Society of Actuaries in North America admitted its first female member in 1894 whilst the first Fellow of the Institute of Actuaries qualified in 1923 (De Valois, 2007). The first black African South African woman (Ndivhuwo Ravele) qualified as an actuary in 2005 (Els, 2009).

Bellis (1996) notes that, in Australia in the 1970s, women were unlikely to receive scholarships from employers in their first year of study, but only in their second or third year once they had proved themselves. Heather McLeod was the first woman to receive an actuarial bursary in South Africa when she studied at the University of Cape Town between 1979 and 1982. She was also the first woman to serve on the Council of the Actuarial Society in 1992.

The UK profession has only recently appointed its first female president, Jane Curtis, as of June 2011 (Scanlan, 2011). In that respect the South African profession has been slightly ahead: the first woman President of the Actuarial Society, Janina Slawski, held office from 2003 to 2005.

The public profile and structures of the South African actuarial profession reflect the male-dominated nature of the profession. Of the 13 Actuarial Society Council members in 2011 only two are women. There are four operational boards that report to Council and the chair of each of these boards is male. The Murray Medal, the profession’s most prestigious award, has only ever had male recipients since its inception in 1972 (Actuarial Society of South Africa, 2011).

The proportion of Fellow actuaries in South Africa who are women has increased dramatically over time from 2% in the mid-1980s to 5% in the mid-1990s to the current 15%. In order to assess the likelihood of further increases in gender diversity we need to analyse the proportion of women entering the profession and their likely persistency through the qualification process.

3. ATTRACTING WOMEN INTO THE ACTUARIAL PROFESSION

3.1 Factors affecting the entrance of women into the profession

The typical route to qualification as an actuary in South Africa is via a first degree in Actuarial Science (Naidoo, 2008). Most universities in South Africa offering actuarial programmes are accredited by the Actuarial Society to provide exemptions from some of the professional examinations. We can thus approximate the gender diversity of entrants into the profession by analysing the profile of entrants into university actuarial programmes.
The entrance requirements into actuarial programmes are high. Requirements vary between universities and from year to year, but usually require excellent mathematics scores and high overall performance. Actuarial programmes typically attract the top 5% of school leavers (Bellis, 1996).

The gender diversity of entrants into Actuarial Science will thus depend on gender differences in high school performance and particularly mathematics performance, as well as the usual factors impacting career choice: genuine interest based on intrinsic factors such as intellectual interest, availability of jobs, opportunities for career advancement, earning potential, and the influence of socialisers such as teachers and parents (Dick & Rallis, 1991; Jawitz, Case & Tshabalala, 2000).

Stereotypes about female mathematical inferiority persist despite evidence of declining differences in mathematical performance between male and female students. Gains over time in the achievement of girls are indicative of the importance of the environment in the cultivation of both mathematical ability and interest (Hill, Corbett & St. Rose, 2010). Recent research suggests that differences in mathematical ability between sexes are strongly mediated by environmental factors such as the classroom atmosphere, gender role expectations and personal variables such as self-esteem (Hill et al., 2010; Lawrence & Charbonneau, 2009; Pomerantz, Altermatt & Saxon, 2002; Ubuz, 2011).

Early studies indicated significant differences between the mathematical ability of male and female students (Benbow & Stanley, 1980) but more recent research indicates that differences persist in some countries and not others (Else-Quest, Linn & Shibley Hyde, 2010). South Africa exhibited low levels of gender difference in both mathematical performance and mathematical confidence (Else-Quest et al., 2010). It is not clear from the published research whether this result holds for high performing students and further work is needed to determine the profile of the pool of school-leaving students who would meet the entrance requirements for actuarial science.

A study of the career choices of young South African women who are high achievers in school mathematics and physical science (Jawitz et al., 2000) found that parents play a key role in influencing choice. The default choice for women in this group was found to be medicine. At the time the intake into the MBChB at UCT was 65% female. The type of school attended (for example, whether the school was a strong science school or not) also played a role, as did work shadow experiences and perceived job opportunities.

Martineau (1997) draws attention to the fact that female students tend to receive more moral and financial assistance when they pursue careers that are traditionally female-dominated, such as nursing. She also argues that low enrolment rates and high dropout rates of female university students in South Africa are a consequence of parental expectations.

Actuarial employment regularly rates amongst the top-ranked jobs across a range of criteria (Strieber, 2011). We would thus expect it to be positively perceived by school-leaving students and their socialisers. However, as noted by Slattery (2004) there is a low level of awareness of the actuarial profession by the general public.
3.2 New entrants into actuarial science at UCT

We had access to detailed data from UCT and not from other universities. The UCT programme is large and long established and we would expect it to be representative of other university programmes. The UCT programme has also been the focus of other research (Dorrington & Vergeest, 1988; MacDonald & Dorrington, 1994; Slattery, Dorrington, & Zietsman, 2000).

UCT has offered a programme in actuarial science since 1968. In 1973, the University of Cape Town became the first university in South Africa to offer courses which allowed students to gain exemption from writing professional examinations once they had graduated. At present, students can obtain a maximum of ten exemptions during the course of their undergraduate actuarial science degree, from a total of 15 professional examinations.

The majority of UCT students graduate with a Bachelor of Business Science degree in Actuarial Science. This is a fixed curriculum degree covering actuarial, finance and general business courses (Slattery et al., 2000) and is accredited by both the Actuarial Society of South Africa and the Institute/Faculty of Actuaries in the United Kingdom. The Actuarial Science division at UCT offers a range of other degrees, including a Bachelor of Business Science in Quantitative Finance (introduced in 2000) and a Bachelor of Commerce degree in Actuarial Science (introduced in 2010). A Bachelor of Science in Actuarial Science was offered up to 2009 but has been discontinued.

For the purposes of this study, an actuarial science student was taken to be any undergraduate student that had registered for the course ‘Introduction to Actuarial Science’ whilst registered for a degree at UCT. Entrance to this course is restricted to Actuarial Science students. The number of entrants into the UCT actuarial programme has increased steadily over time, despite increased competition from other universities offering actuarial programmes. It should be noted that these figures do not include those who switch majors and deregister from ‘Introduction to Actuarial Science’ during their first year.

Table 1 illustrates the average number of entrants into the programme as well as the proportion of entrants who are female.

The proportion of female entrants into Actuarial Science has risen steadily over time. The figures are broadly in line with previous research that indicated that roughly two-thirds of entrants are male (Slattery, 2004). The extent to which it is possible for the proportion of female students to rise further will depend on the gender profile of the pool of eligible school leavers. The levers for increased participation are likely to be work-shadow opportunities, school guest speakers, increased parental awareness of actuarial career opportunities and individual career guidance.

We now consider the persistency of women students through the undergraduate process and the relative performance of male and female students.
Table 1 Number of entrants and proportion of female entrants by year of entry

<table>
<thead>
<tr>
<th>Year of Entry</th>
<th>Average Number of Entrants</th>
<th>Proportion of Female Entrants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970–1979</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>1980–1984</td>
<td>19.4</td>
<td></td>
</tr>
<tr>
<td>1985–1989</td>
<td>29.0</td>
<td>10–15%</td>
</tr>
<tr>
<td>1990–1994</td>
<td>39.8</td>
<td></td>
</tr>
<tr>
<td>1995–1999</td>
<td>70.4</td>
<td>24.1%</td>
</tr>
<tr>
<td>2000–2004</td>
<td>102.6</td>
<td>31.4%</td>
</tr>
<tr>
<td>2005–2009</td>
<td>117.8</td>
<td>33.6%</td>
</tr>
<tr>
<td>2010–2011</td>
<td>121.5</td>
<td>36.6%</td>
</tr>
</tbody>
</table>

Figures pre-1995: Slattery et al. (2000)

4. RELATIVE PERFORMANCE OF FEMALE STUDENTS
4.1 Factors affecting student performance
The dominant theory regarding the relative under-performance of female students in fields where negative stereotypes exist is deemed stereotype threat. Steele (1997) formally defines stereotype threat as “the event of a negative stereotype about a group to which one belongs becoming self-relevant, usually as a plausible interpretation for something one is doing, for an experience one is having or for a situation one is in that has relevance to one’s self-definition” (p616). Given the male-dominated nature of the actuarial profession and the stereotypes that persist regarding the mathematical ability of women we expect women in the actuarial profession to be vulnerable to stereotype threat.

The literature does not argue that individuals who are exposed to stereotypes will internalise them and therefore come to believe that they are inferior, but asserts that these individuals will be aware of these negative stereotypes and the knowledge of their existence may induce fears of fulfilling these typecasts (Steele, 1997). An individual does not have to believe that a stereotype is true or that they personally verify the stereotype in order to experience stereotype threat (Bell et al., 2003).

Stereotype threat experienced by women in male-dominated spheres appears to have a negative effect on their performance (Cadinu et al., 2005). Females who find themselves in situations where a negative stereotype could be associated with them had the tendency to entertain negative thoughts which had an adverse effect on their performance. Lawrence and Charbonneau (2009) also showed that undergraduate female students who believed that their performance in a test would convey information about their ability had a higher propensity to produce poor results.
Stereotype threat appears to affect the upper echelon of academic achievers, those who possess enough skills and self-belief to have identified with the domain to begin with, more than the average student (Bell et al., 2003). Students who gain entrance, either into an actuarial science undergraduate degree or directly into the profession, are those who have excelled academically at high school. It is therefore reasonable to assume that these students are invested in their academic pursuits and are therefore identified with the academic domain.

Steele (1997) suggests that prolonged stereotype threat may diminish motivation and may ultimately lead to an individual disengaging from the domain. This is particularly relevant for actuarial science where motivation and perseverance are important. Fisher and Margolis (2002) observed that women frequently cited a lack of interest as the reason for withdrawing from a programme, but that this drop in interest was preceded by a drop in confidence.

Based on these studies, it seems likely that female actuarial science students will experience stereotype threat, which may impair their academic performance. These findings are rather disconcerting as they suggest that as they suggest that the best female students are at greater risk of experiencing stereotype threat and becoming disengaged, which may ultimately lead to them dropping out of an actuarial science programme.

Simonite’s (2005) research reveals that there is a tendency for the performance gap, between male and female students who are pursuing studies in mathematical sciences, to widen at more selective universities such as Cambridge and Oxford in the UK compared to less selective universities. UCT is one of the most selective universities in South Africa and tends attract some of the best students in the country and we can therefore expect the performance gap to be larger than at other universities.

Fisher and Margolis (2002) document the transformation of a computer science department in the United States where they increased the proportion of female entrants and reduced differentials between male and female persistency. As with actuarial science, the programme in question is highly competitive. They found that the academic culture perpetuated the barriers experienced by female students. In their particular case they found an academic culture that was male oriented, that promulgated expectations of male success and resulted in continual questioning of the abilities of female students. Their interventions were wide ranging: from changes in the curriculum to the training of tutors to the introduction of a series of cohesion-building events for women students.

They found that the motivation for choosing the field of study were different for male and female students, with women being more motivated by the broader applications of the field. In order to improve the motivation levels of women students they made efforts to teach in a social context by situating early teaching in realistic settings and exploiting the connections between their discipline and other disciplines.

Seymour and Hewitt (1997) highlight the importance for female students of positive relationships with academic staff: “To be faced with the prospect of four
years of isolation and male hostility on the one hand, and the abrupt withdrawal of familiar sources of praise, encouragement and reassurance by faculty on the other is, in our view, the most common reason for the loss of confidence that makes women particularly vulnerable to switching” (p271).

4.2 Relative persistency of male and female students

Previous research by Slattery, Dorrington and Zietsman (2000) on the South African actuarial profession found that the persistency of female actuarial science undergraduate students and the proportion graduating at the University of Cape Town remained low.

Data on student performance since 1995 at UCT were obtained from the Institutional Planning Department at the University of Cape Town. Earlier figures are drawn from Slattery et al. (2000).

We define persistency as the proportion of students entering into an actuarial programme who ultimately graduate from that programme. As with Slattery et al. (2000) we find that male persistency rates are higher than female persistency rates in all three periods considered. The persistency rates vary from period to period and there has been no discernible trend over time. It should be noted that the 2006 figure is slightly understated as there are students who began in that year who are still in the system.

**Table 2 Persistency by sex and year of entry**

<table>
<thead>
<tr>
<th>Year of Entry</th>
<th>Female persistency</th>
<th>Male persistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995–1999</td>
<td>34.1%</td>
<td>40.8%</td>
</tr>
<tr>
<td>2000–2004</td>
<td>36.6%</td>
<td>48.3%</td>
</tr>
<tr>
<td>2005–2006</td>
<td>31.8%</td>
<td>43.1%</td>
</tr>
<tr>
<td>1995–2006</td>
<td>34.9%</td>
<td>44.7%</td>
</tr>
</tbody>
</table>

We used a two-proportion z-test to determine whether the difference between the two proportions over the period 1995 to 2006 is significant and found the difference to be significant at the 1% level.

A stricter definition of persistency would be to look at the proportion of those entering who graduate within the minimum recommended duration of the degree. This analysis was done for the Business Science degree, as this is the degree that the majority of actuarial graduates exit with (79.3%). It is evident that the percentage of students who graduate within the minimum recommended duration of the degree is low for both male and female students in each cohort. Using the two-proportion z-test we found the difference between the proportions graduating to be statistically significant at the 5% level (for the cohorts between 1995 and 2006).
Table 3 Proportion of Business Science students graduating in four years by sex and year of entry

<table>
<thead>
<tr>
<th>Year of Entry</th>
<th>Average Number of Entrants</th>
<th>Proportion of Female Entrants Graduating in 4 Years</th>
<th>Proportion of Male Entrants Graduating in 4 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995–1999</td>
<td>58.0</td>
<td>26.0%</td>
<td>25.8%</td>
</tr>
<tr>
<td>2000–2004</td>
<td>84.8</td>
<td>21.4%</td>
<td>33.6%</td>
</tr>
<tr>
<td>2005–2006</td>
<td>88.0</td>
<td>24.5%</td>
<td>29.9%</td>
</tr>
<tr>
<td>1995–2006</td>
<td>74.2</td>
<td>23.4%</td>
<td>30.2%</td>
</tr>
</tbody>
</table>

From the data available it is only possible to differentiate between students transferring to other degrees at UCT, those withdrawing from UCT voluntarily (i.e. for reasons other than academic exclusion) and those who were academically excluded. Students transferring to other academic programmes may do so because they have failed to meet the academic requirements to progress with actuarial science or may do so voluntarily. The majority of students who withdraw from actuarial science do so by transferring to another academic programme (Table 4).

Table 4 Forms of withdrawal by sex

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfers</td>
<td>81%</td>
<td>73%</td>
</tr>
<tr>
<td>Voluntary Drop Out</td>
<td>11%</td>
<td>12%</td>
</tr>
<tr>
<td>Academic Exclusion</td>
<td>8%</td>
<td>15%</td>
</tr>
</tbody>
</table>

A higher proportion of female students than male students withdraw in each year (Figure 1). This is calculated as the number of students withdrawing in each year as a percentage of the number of students enrolled at the beginning of the year. Although the differential between male and female students is fairly consistent across the year only the difference in the first year is statistically significant at the 5% level (using the two-proportion z-test) because of the smaller number of students in the later years. For both sexes the proportion withdrawing at the end of year one is likely to be understated as a proportion of students will exit early during their first academic year and thus not appear in the starting cohort at all.

As expected, female students are less likely to persist with actuarial science than male students. Given that the majority of students transfer to other academic programmes it is important for further work to be done to identify the proportion of transfers that occur voluntarily. Understanding the underlying reasons for voluntary transfers may help in designing strategies to improve the retention of talented students.
4.3 Relative performance of male and female students

In order to analyse the relative academic performance of male and female students we use the number of exemptions gained as a measure of academic success. The number of exemptions gained has previously been found to be a reasonable indicator of qualification success and the time to qualification: over 70% of graduates who enter the profession with an above average number of exemptions can be expected to qualify, and most of these in less than five years (Slattery et al., 2000).

Exemption data was analysed for six entry-year cohorts (2000 to 2005 inclusive) for students graduating with the Business Science degree in Actuarial Science. Students graduating before 2005 had a total of nine exemptions available to them; whilst those graduating from 2005 onward had ten exemptions available to them. The average number of exemptions obtained by female students was 6.40 over the period, compared to an average of 6.35 for male students. The proportion of students obtaining seven or more exemptions (i.e. more than the average) was calculated and it was found that for both male and female students this proportion was approximately 50%.

This result indicates that there is no statistically significant difference in the academic success of male and female students who do persist and graduate with an actuarial science degree from UCT. We would thus expect graduating students of both genders to be equally likely to ultimately qualify as actuaries if there are no differences in their subsequent performance in the professional examinations. To ascertain whether this is the case we consider the relative performance in professional examinations and the gender diversity amongst different age groups and categories of membership.

![Figure 1](image-url)
5. WOMEN IN THE SOUTH AFRICAN ACTUARIAL PROFESSION

5.1 Relative performance in the professional examinations

An analysis of performance in the professional examinations by Diedericks (2009) found differences in performance between male and female students in individual subjects. In the most recent period analysed (2005 to 2008) male students performed better on CT1, CT2 and CT3 whilst female students performed better on CT5 and CT7. There was almost no difference in performance across the full set of early, more technical subjects, both pre- and post- major curriculum review in 2005 (the 100-series which later became the CT-series). Female students outperformed male students in the latter subjects which deal with more applied concepts, both pre- and post- major curriculum review in 2005. Although the difference in performance was consistently observed it was found to not be statistically significant.

### Table 5 Performance of male and female students in professional examinations

<table>
<thead>
<tr>
<th>Subject set</th>
<th>Time period</th>
<th>Male aggregate pass rate</th>
<th>Female aggregate pass rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT series</td>
<td>2005–2008</td>
<td>47%</td>
<td>48%</td>
</tr>
<tr>
<td>CA1, CA3, ST and UK-SA series</td>
<td>2005–2008</td>
<td>31%</td>
<td>34%</td>
</tr>
<tr>
<td>CT/100 series</td>
<td>1998–2008</td>
<td>45%</td>
<td>46%</td>
</tr>
<tr>
<td>CA3/201 and ST/300 series and UK-SA/400 series</td>
<td>1998–2008</td>
<td>30%</td>
<td>34%</td>
</tr>
</tbody>
</table>

Source: Diedericks (2009)

5.2 Membership profile

A comprehensive report on women in the Science, Technology, Engineering and Mathematics (STEM) professions in the United States reported a growing number of women in these professions, but continued under-representation particularly at the graduate level and in the workplace (Hill et al., 2010).

Data on the members of the Actuarial Society were obtained directly from the Society’s Cape Town office in the form of the 2010 member database. Additional information was drawn from the Society’s webpage and a series of posters produced by the Society. Lists of new academic qualifiers were obtained from email communication sent out by the Society.

The proportion of Fellow members who are female varies across race groups. Of concern is the low proportion of black African Fellow members who are female (6%). For all race groups the proportion of Student members who are female is higher than the proportion of Fellow members who are female. This is similar to the UK where in 2006, 19% of UK Fellows were female whilst 32% of UK Student members were female (De Valois, 2007). Similarly, 35% of Affiliates (mostly students) in the Australian...
profession were female in 2002, as compared to 17% of Fellows (Howes, 2002). There were only 40 Associate members in South Africa in 2010 (of which 60% are female).

Table 6 Proportion of members who are female in each race group (2010)

<table>
<thead>
<tr>
<th>Race Group</th>
<th>Proportion of Fellow members who are female</th>
<th>Proportion of Student members who are female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black African</td>
<td>6%</td>
<td>27%</td>
</tr>
<tr>
<td>Coloured/Indian/Oriental</td>
<td>26%</td>
<td>37%</td>
</tr>
<tr>
<td>White</td>
<td>16%</td>
<td>32%</td>
</tr>
<tr>
<td>Unknown</td>
<td>12%</td>
<td>27%</td>
</tr>
<tr>
<td>Total</td>
<td>15%</td>
<td>31%</td>
</tr>
</tbody>
</table>

As discussed by Howes (2002) the possibility exists that the differential between female representation amongst Students and Fellows may be explained by the relatively recent attraction of women into the profession, but may also indicate that women are more likely to cease studies and not progress toward the final qualification. Given the long qualification time we expect the proportion of female Fellow members to lag the proportion of female Student members, but we also need to consider the relationship between this long qualification period and prime child-bearing years (Howes, 2002).

In order to get a sense of whether the differential between Student members and Fellow members is as a result of women not persisting with their studies we analysed the age profile of both the Student and Fellow members of the profession. Age data were missing for 13.77% of student members and 6.71% of Fellow members. The age data that are available are reflected in the table below (Table 7).

Table 7 Proportion of members who are female in each age category (2010)

<table>
<thead>
<tr>
<th>Age Category</th>
<th>Proportion of Fellow members who are female</th>
<th>Proportion of Student members who are female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 26</td>
<td>N/A</td>
<td>39%</td>
</tr>
<tr>
<td>26–30</td>
<td>26%</td>
<td>32%</td>
</tr>
<tr>
<td>31–35</td>
<td>25%</td>
<td>31%</td>
</tr>
<tr>
<td>36–40</td>
<td>17%</td>
<td>19%</td>
</tr>
<tr>
<td>41–50</td>
<td>13%</td>
<td>18%</td>
</tr>
<tr>
<td>Over 50</td>
<td>3%</td>
<td>11%</td>
</tr>
<tr>
<td>Unknown</td>
<td>8%</td>
<td>30%</td>
</tr>
<tr>
<td>Total</td>
<td>15%</td>
<td>31%</td>
</tr>
</tbody>
</table>
For both categories of members the representation of female members is higher in younger age categories. Furthermore, of the 53 students completing the academic requirements for the Fellowship qualification in 2011, 34% were female. This, together with the profile of the student membership, indicates that the proportion of female actuaries is likely to increase over time, albeit slowly because of the current heavy weighting towards males.

There is little information available on the progress of female actuaries in South Africa into senior management and executive positions, and whether there exists a “glass ceiling”. In 1992 the UK profession set up a working committee to assess the progress and experience of women in the actuarial profession. In a survey conducted amongst female members they found that 18% felt that being a woman hindered their careers (Bellis, 1996). A survey conducted of members of the Institute of Actuaries of Australia in 1994 revealed an improvement over time in employment opportunities, but that a proportion of women continued to face discrimination in the workplace (Bellis, 1996). Similar work is necessary in the South Africa context.

6. DISCUSSION AND RECOMMENDATIONS
Whilst the South African actuarial profession is currently male-dominated there are positive indications for future gender diversity. These include:
— A continued increase in the proportion of female entrants into an actuarial undergraduate programme;
— Higher levels of diversity amongst Student members of the profession, younger Fellow members and new qualifiers; and
— No difference in the average number of exemptions that male and female students graduate with and no statistically significant difference in their relative performance in professional examinations.

The bottlenecks appear to relate to the undergraduate portion of the qualification process. Whilst there has been an increase in the proportion of female entrants the intake into university programmes is not yet gender balanced. The profession can play a role by actively recruiting women into the actuarial profession. This is particularly important for programmes like Actuaries on the Move and the South African Actuarial Development Programme that have access to schoolgoers. Employers have a role to play in the creation of work shadow opportunities through programmes such a “Take a Girl Child to Work” which may serve to increase awareness amongst female schoolgoers. Employers can also use bursary and scholarship programmes to draw female students into actuarial programmes.

However, as pointed out by Slattery (2004) we must be cautious about luring potential students into actuarial science unless they are suited to the arduous qualification process and mindful of the damage we may do to the high proportion of students who do not persist.
More than 10 years ago Slattery et al. (2000) pointed to the need to improve the persistency of female students at undergraduate level. It is concerning that persistency rates for female students are significantly lower than for male students, with just over a third of female students who enrol for an actuarial science degree ultimately graduating and less than a quarter graduating in the minimum time. There is still considerable work that needs to be done to better understand the reasons for differential persistency between male and female students. We also need to establish the extent to which this varies between university programmes.

The actuarial profession is susceptible to the effects of stereotype threat. Negative stereotypes about the ability of women to qualify as actuaries can be counteracted by exposing people to female actuarial role models, publicising the increased number of women achieving at higher levels in the profession and pointing out the lack of difference in performance between the sexes in the professional examinations (Hill et al., 2010). Furthermore, ensuring a departmental culture within academic institutions that is attractive to more female academics can assist with creating role models and attracting students into the profession.

There are also pedagogical implications for the way in which actuarial science is taught if we wish to improve the persistency of female students. Hill et al. (2010) suggest developing a classroom environment that emphasises that intellectual skill can be improved with perseverance and effort and argue that students (and academics) should be taught about stereotype threat. Fisher and Margolis (2002) found that female students benefit from real-life applications in early courses, contextualised teaching and emphasis of inter-disciplinary connections. This approach is also advocated by Hill et al. (2010) who say that providing a broader overview of the field in introductory courses can result in large gains in recruiting female students.

Poor results and high failure rates are common in actuarial courses. Hill et al. (2010) argue that this creates uncertainty which has a disproportionately negative effect on students who do not have a sense of belonging (both women and black students). Clarifying expectations assists students with judging their performance more accurately and serves to reduce uncertainty. Fisher and Margolis (2002) advocate the need to promote the idea that there are multiple ways to be in a discipline. This can be achieved by presenting diverse problems and teaching styles.

In 2002, Howes (2002) published a call to women actuaries in Australia to put themselves forward to serve on the Australian profession’s Council. At that time there were two women of the 15 members of the Australian Council. Given the similar low representation on the South African profession’s Council, every effort should be made to encourage the participation of women in the profession’s activities.

Areas for further research include:
— Determine the profile of the pool of school-leaving students who would meet the entrance requirements for actuarial science;
— Identifying the motivation for female students to join and persist in the actuarial profession;
— Characterising the current academic culture and pedagogical approach in Actuarial Science departments in South Africa;
— Establishing the vulnerability of actuarial students to stereotype threat;
— Investigating the retention of women in the profession once they are in employment; and
— Identifying differentials in employment conditions for male and female actuaries in South Africa, barriers to progress and strategies for increasing representation at senior levels.

Both Slattery (2004) and Naidoo (2008) have commented on the need for the actuarial profession to become more diverse, and to become more representative of South African society. It is clear that the representation of the women in the profession has increased over time. However, this representation is still poor at the more senior levels of the profession and in the structures of the profession. It is therefore important for the profession to look into possible actions that one can employ to counter the prevailing bias. Similarly, actuarial employers have clear incentives to support increased gender diversity in the actuarial profession given the relationship between corporate performance and gender diversity, global moves towards quotas for boards and targets in the Financial Services Charter.

REFERENCES
Actuarial Society of South Africa. (2011). About Us
Scanlan, M (2011). Jane Curtis becomes President of the Institute and Faculty of Actuaries.