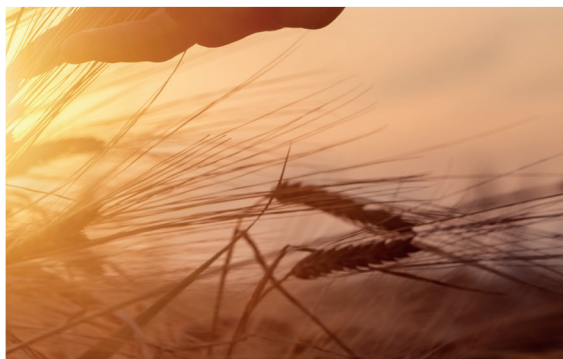
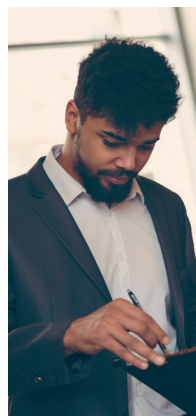


Social mobility: a survey of the UK chemical engineering profession

Summary of a survey
conducted by the Diversity
and Inclusion Working Group
(DIWG), a sub group of the
London & South East Coast
Members Group



December 2018



Contents

| | |
|--|-----------|
| Executive summary | 3 |
| Introduction | 4 |
| Respondent demographics | 5 |
| Age and gender..... | 5 |
| Ethnicity..... | 6 |
| Regional distribution of chemical engineers..... | 7 |
| Social class..... | 8 |
| Family background..... | 8 |
| Receipt of benefits..... | 9 |
| Regional trends..... | 10 |
| University education..... | 14 |
| Parental education..... | 14 |
| Personal education..... | 14 |
| Working as a chemical engineer..... | 19 |
| Professional registration and development..... | 19 |
| Reflection on your career..... | 20 |
| Career progression..... | 20 |
| Changes in social class..... | 20 |
| Has social class held you back?..... | 22 |
| Regional effects – where are the opportunities?..... | 24 |
| Conclusions..... | 26 |
| Social background..... | 26 |
| Gender and ethnicity..... | 27 |
| Location..... | 27 |
| Educational and professional attainment..... | 28 |
| A career in chemical engineering is a vehicle for social mobility..... | 28 |
| How this is relevant to IChemE?..... | 29 |
| Opportunities for the profession..... | 29 |
| Acknowledgement..... | 29 |
| Appendix A: survey questions | 30 |
| Appendix B | 35 |
| Appendix C | 37 |
| Working as a chemical engineer..... | 37 |
| Entering the workplace..... | 37 |
| Appendix D | 38 |
| Perceptions of how social class has held an individual back..... | 38 |

Executive summary

In late 2017, the Diversity and Inclusion Working Group established a sub-group to look at social mobility and they surveyed IChemE's UK members about their backgrounds and careers. The survey aimed to determine if a career in chemical engineering provided a pathway for upward social mobility. Over 1,200 members responded to the survey, representing more than 7% of IChemE's UK membership.

The report highlights several trends in the chemical engineering profession. The working group identified a few aspects of significance: social background; gender and ethnicity; location; and educational and professional attainment.

Overall, chemical engineering is seen by IChemE members as a profession where social mobility is possible. Almost 75% of survey respondents identified themselves as coming from a working or lower middle class background. However, this percentage is shrinking in younger-age demographics

The number of female chemical engineers has increased in recent times and currently stands at 28% for those under the age of 25. Similarly, the number of chemical engineers from minority ethnic groups has increased to 9%, but there is still a need to improve and consider further analysis of the complex interrelationship between social class, gender, and ethnicity.

Region can influence access to chemical engineering and career opportunities. This is visible throughout education in terms of regional deprivation and access to work experience and awareness of the profession. Industries that employ chemical engineers are not evenly spread across the UK and therefore many people move to study (at university) and then again for jobs. Clusters of chemical engineering employers exist in the North East, North West, Scotland and the South East. For many respondents, moving for work is not an issue, but where it is, family is the main reason that prevents people from moving.

Over 60% of respondents believe where you live influences your career opportunities.

University provides fairer access to opportunities for people from different social backgrounds.

At the moment, careers in chemical engineering appear to be dominated by graduates. Only 1% of survey respondents did not hold a degree or higher qualification. This could limit accessibility to those from a disadvantaged background, but further monitoring of social demography in chemical engineering is needed. Once at university, the playing field is levelled, and social background is not a barrier to career opportunity or progression. However, there are some differences in career sector and roles pursued based on social background. Earnings appear to be independent of social background, and levels of career satisfaction are broadly equivalent.

The majority of respondents were Chartered or working towards professional registration. It is notable that those from a socially disadvantaged background were more likely to have pursued and achieved professional registration.

The survey clearly shows that chemical engineers believe that their career has provided them with the opportunity for upwards social mobility.

Chemical engineering is a diverse profession that reaches across many industry sectors and areas of life. Despite recent economic challenges in some sectors (eg the contraction of the oil and gas sector), recruitment of chemical engineers continues and the discipline is recognised as being essential to delivering outcomes that provide solutions for industry and society as a whole; contributing to national economic growth.

There is opportunity to continue to monitor the social demography of the chemical engineering profession and gather more detailed information to improve the understanding of backgrounds.

Introduction

The Institution of Chemical Engineers (IChemE) exists to promote competence and a commitment to good practice, to advance chemical engineering worldwide for the benefit of society. As a signatory to the Royal Academy of Engineering Diversity Concordat¹ and the Science Council Declaration on Equality, Diversity and Inclusion², IChemE is committed to diversity within the chemical engineering profession. The Institution aspires to reflect the diversity of society in the profession that serves it.

Equality, diversity and inclusion (ED&I) feature in IChemE's strategy and work programme. It is recognised that ED&I is important to the profession, and the sectors and organisations where current and future chemical engineers work.

Members of IChemE are also active in raising awareness and understanding of ED&I issues. In particular, the Institution's London & South East Coast regional member group in the UK has a Diversity and Inclusion Working Group (DIWG) specially established to focus on issues surrounding ED&I in the UK. The group's work is driven by the interest of members and a desire to better understand barriers to participating in chemical engineering.

In late 2016, the DIWG conducted a survey of members in the UK to look at the effect of social background on university attendance, qualification and entry into the workplace for chemical engineers. This initial report looked at background of those who studied chemical engineering and pursued employment as chemical engineers. The aim was to examine whether social background affected attainment in post-tertiary/higher

education. The findings from this survey were published in 2017.³ It was found that respondents from families where at least one parent or guardian had attended university, or where the main family's main earner occupation was classified as managerial, senior, or professional occupation, have a tangible advantage. They were also more likely to have studied a chemical engineering degree programme at a top-ranked university.⁴ No particular advantage was identified for those respondents attending fee-paying schools.

Once at university, it is evident that there is fairer access to opportunities, and the ability to get a job in chemical engineering is significantly influenced by access to summer placements and work experience during the student's undergraduate years.

In 2017, the DIWG decided to conduct further research into social mobility within chemical engineering. A second survey was sent to members, this time excluding undergraduates because it was designed to ask about the pursuit of chemical engineering as a career. The aim of this survey was to understand if a career in chemical engineering enabled upward social mobility.

Over 1,200 members participated in the 2017 survey. While the respondents were self-selecting, this number represents 7% of IChemE's UK non-student membership at the time.

Respondent demographics

The survey questions gave all respondents the opportunity to answer "prefer not to say". For the demographic analysis, these responses have been removed from the totals.

Age and gender

Of the 1,226 respondents, 99% identified as male or female. A total of nine people selected other options for the question which were "other" or "prefer not to say". Of those that identified as male or female, 78% were male and 22% female. This aligns well with IChemE's non-undergraduate UK membership, which is 81% male and 19% female. The overall IChemE membership reflects the trend that female participation in the profession has gradually increased over the last several decades (Figure 1). This trend is echoed by the number of female respondents (Figure 2). Although almost 12% of IChemE's UK membership (excluding students) is aged over 65 years, over 16% of respondents were in this category (n = 203). This was the largest group of respondents.

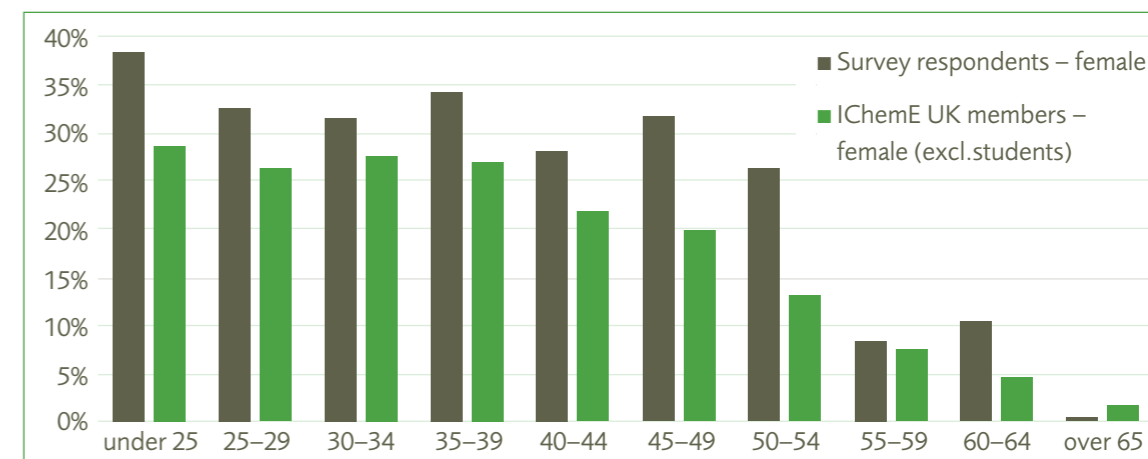


Figure 1. Gender distribution of survey respondents and IChemE members (July 2018)

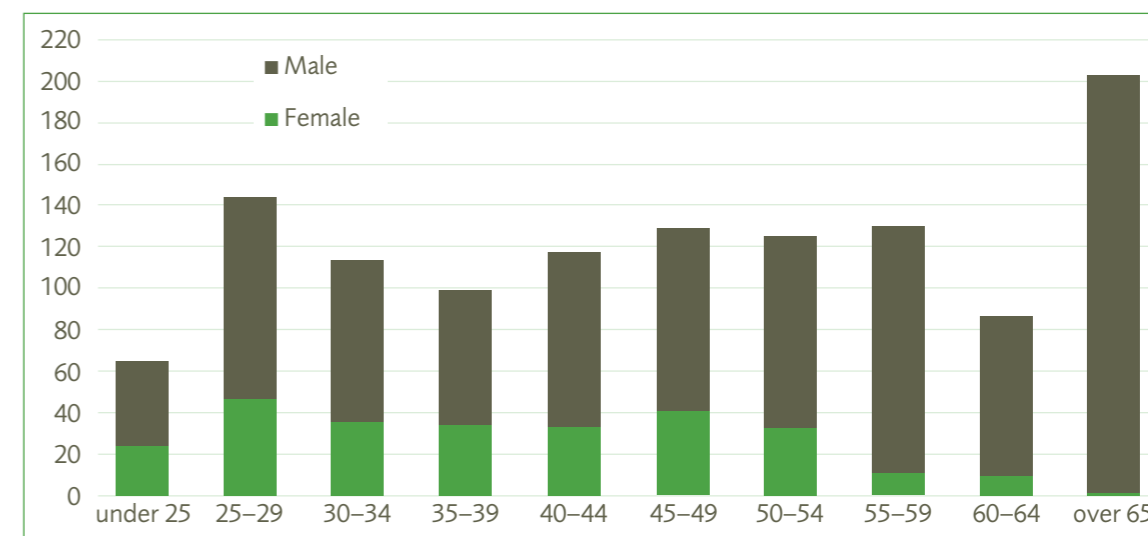


Figure 2. Gender and age distribution of respondents

¹ Royal Academy of Engineering Diversity Concordat, <http://bit.ly/2M9WH5X>

² Science Council Declaration on Equality, Diversity and Inclusion, <http://bit.ly/2tpTZI3>

³ Institution of Chemical Engineers Diversity and Inclusion Working Group, Social mobility and the chemical engineering profession in the United Kingdom, July 2017, <http://bit.ly/2MvAsbW>

⁴ University ranking was based on the top 200 chemical engineering degree courses according to the 2016 QS World University Rankings. <http://bit.ly/2yrAtu3>

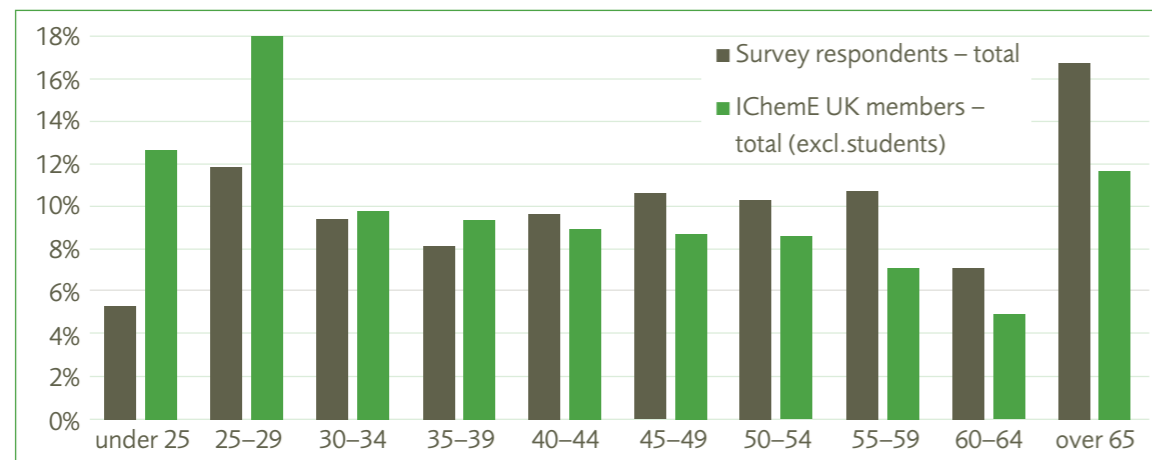


Figure 3. Age distribution of respondents and IChemE members

Ethnicity

Respondents were asked which ethnic group they belong to. The results demonstrate that although IChemE membership is predominantly white, there is greater participation from minority ethnic groups in the younger age groups (Figure 4). A total of 91% identified as being white. A total of 28 people did not wish to identify their ethnicity and/or their age category. Currently, IChemE does not collect data relating to ethnicity of members. In the 2011 census 87% of the UK population described themselves as belonging to the white ethnic group.⁵

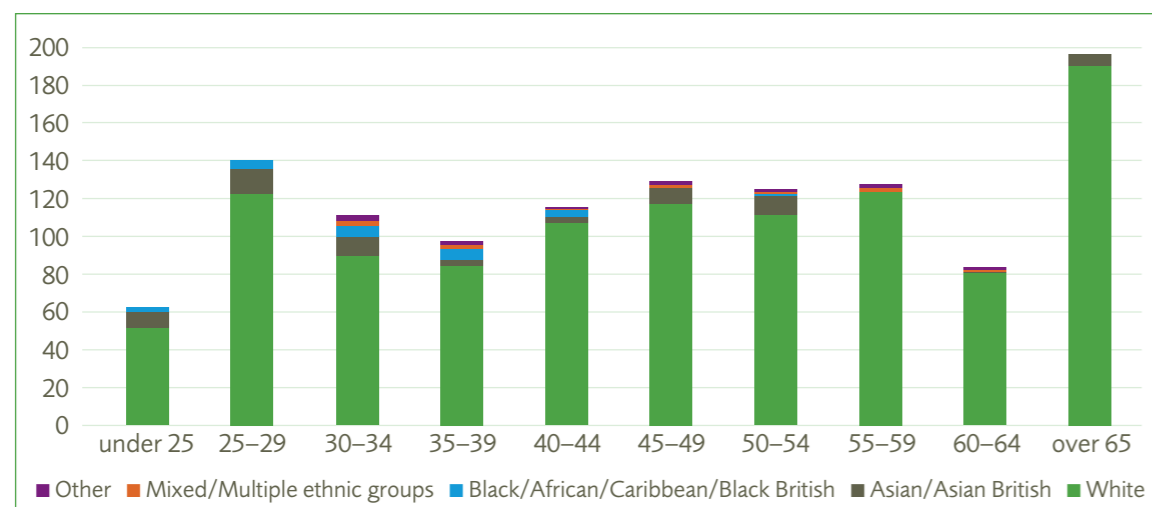


Figure 4. Ethnicity of respondents across the age groups

Of the respondents that identified as non-white, the data shows that the younger age categories (under 34 years) contain the highest percentage of minority ethnic groups (Figure 5). This reflects the change in UK demographics where the 2011 census results show that the population in England and Wales who identified as British decreased from 94% in 1991 to 91% in 2001, and then 86% in 2011.

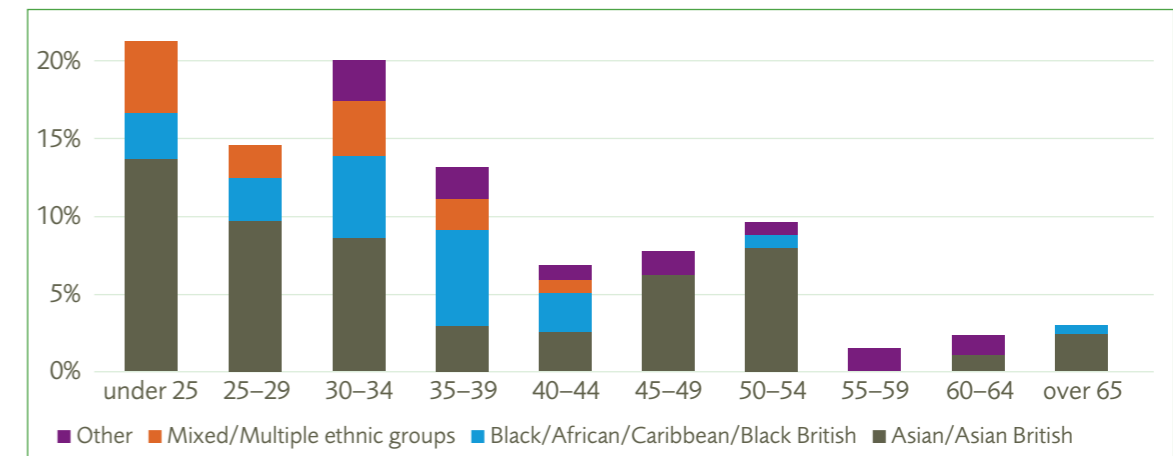


Figure 5. Ethnicity of non-white respondents

Census data from 2011 indicate that 13% (8.1m) of the UK population belonged to an ethnic minority group – the equivalent of one person in eight. Data from Engineering UK state that 8% of workers in the engineering sector are from a minority ethnic group.⁶ In comparison, in the IChemE survey, of those that identified an ethnicity, 9% identified as from a minority ethnic group.

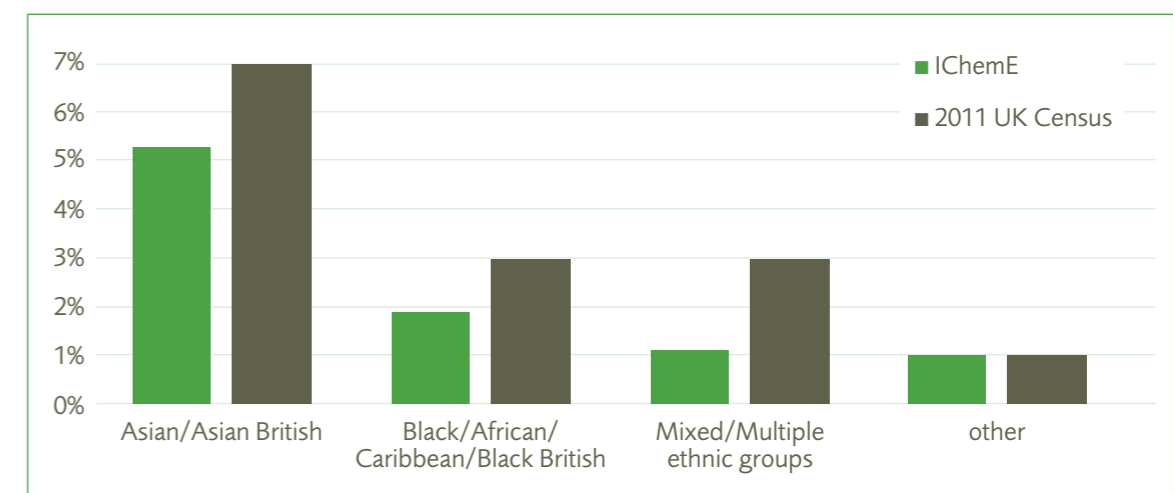


Figure 6. Comparison of non-white survey respondents and UK population (based on 2011 UK Census)

Regional distribution of chemical engineers

It is well recognised that different industries cluster in different regions across the UK. The process industries, and engineering procurement and contracting (EPC) functions have a strong presence in the North East, North West and Scotland with a similar presence in London and the South East.

When compared to the general population (Table 1), IChemE membership is more prevalent around large industrial hubs (eg the North West, Scotland, London and the South East). Chemical engineering is under-represented in regions where there are fewer process industries (the West Midlands and Eastern England). An analysis of the current location of respondents is compared to 2016 UK population estimates in Table 1.⁷

⁶ Engineering UK 2018 state of the nation report, <http://bit.ly/2yx1jRG>

⁷ Office for National Statistics, October 2017, Annual Survey of Hours and Earnings: 2017 provisional and 2016 revised results, <http://bit.ly/2Py2WD9>

Table 1. Distribution of population – comparison of where respondents currently reside

| | Distribution of survey respondents | Distribution of IChemE 2017 salary survey respondents | Distribution of UK 2016 general population |
|--------------------------|------------------------------------|---|--|
| East Midlands | 5% | 5% | 7% |
| Eastern England | 3% | 3% | 9% |
| North East | 5% | 8% | 4% |
| North West | 17% | 18% | 11% |
| Northern Ireland | 1% | 1% | 3% |
| Scotland | 14% | 16% | 8% |
| London | 11% | 29% | 13% |
| South East | 24% | 29% | 14% |
| South West | 5% | 29% | 9% |
| Wales | 4% | 3% | 5% |
| West Midlands | 4% | 4% | 9% |
| Yorkshire and the Humber | 8% | 6% | 8% |

Social class

Family background

The survey asked respondents to self-identify the social background they grew up in. Of those that identified a class, 74% of respondents came from the working (32%) or lower middle class (42%) (Figure 7).



Figure 7. Social background of respondents during childhood

A total of 1,183 respondents shared their geographic region. The main regions where respondents grew up in were the North West (15%), Scotland (12%) and the South East (15%). These three regions represent the main regions where those that identified as working class originate from (in addition to London). Conversely, 13% of upper middle class respondents grew up outside of the UK.

When the social background during childhood is analysed against the age categories there is no notable change in proportion of chemical engineers coming from a working class background. The most significant difference is the change in parental education with a notable decrease in neither parent attending university (82% of over 65s compared to 41% in the under 25s) (Figure 8). This correlates with an increase in the number of people where both parents attended university (5% in the over 65 age category compared to 38% in the under 25 age group). Where one parent attended university, it is most likely to be the father. With an average of 5% (across all age groups) of respondents having only a mother attend university (compared to a father average of 15%). This aligns with the 2016 survey results.

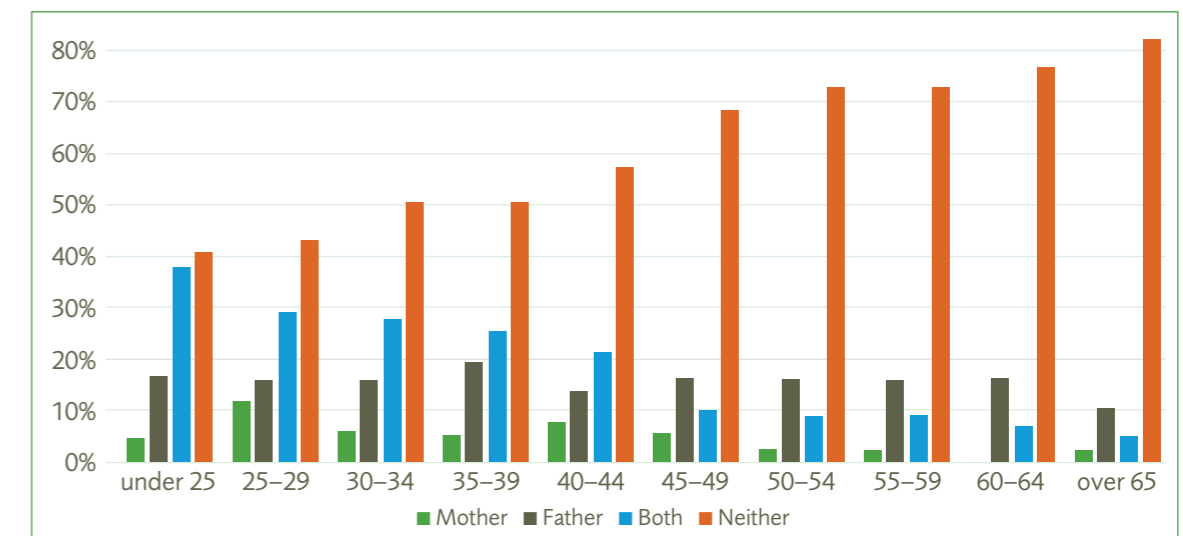


Figure 8. Attendance of parents at university by age of respondents

Receipt of benefits

Another measure of background social position is whether people had received any means-tested benefit such as free school meals, income support, university grants etc. It would be useful to separate the school-age benefits from university grants, but this was not done in this survey. In recent decades there have been considerable changes in the criteria and availability of benefits such as free school meals. Since 1973, the proportion of school pupils receiving free school meals dropped from around 70% in the early 1970s to less than 50% in the late 1980s. It is only in the recent decade that this has increased again. Most recently the eligibility criteria vary across different regions, so comparing benefits across age groups should be done with caution. A 2008 report by the Sutton Trust highlights some changes and impacts on eligibility between 1998 and 2008.⁸ The changes in benefits are complex and are discussed further in Appendix B.

⁸ The Sutton Trust, August 2008, Low-income pupils in high performing comprehensive schools: An analysis of free school meal rates at the highest performing non-selective state schools over the last ten years, <http://bit.ly/2ysGHtr>

The survey shows that in all the age groups over 45 years, over 55% of respondents received some form of means-tested benefit (Figure 9). In contrast, all the age groups under 45 years, 41% or less received means-tested benefits. Of the respondents that received these benefits, 47% defined themselves as coming from a "working class" background and 40% from a "lower middle class" background. These figures also differ significantly from the results of the 2016 survey where only 17% stated they received any form of benefit. This difference could be due to the better definition of means testing in the 2017 survey.

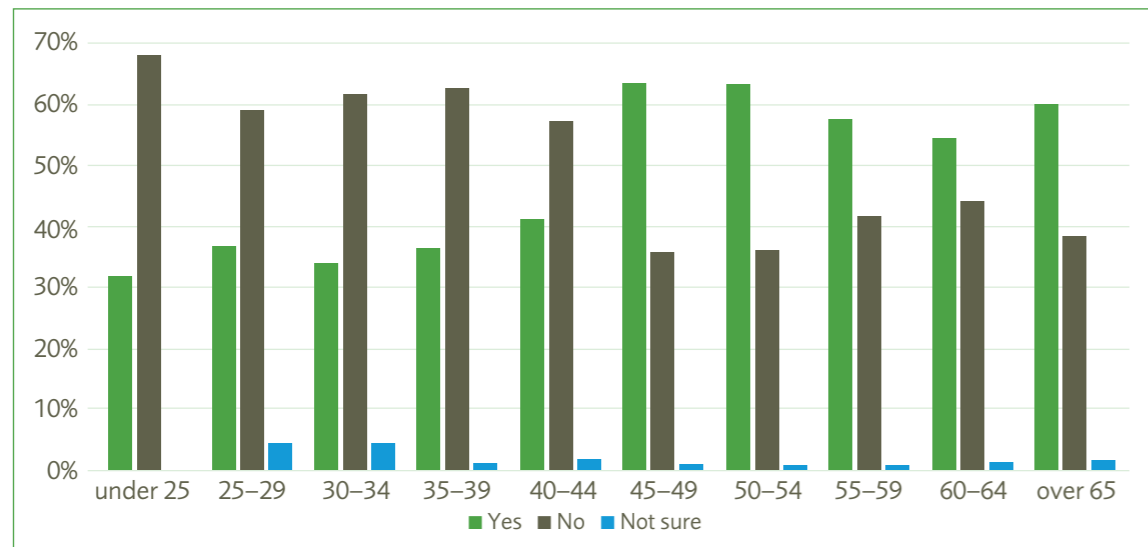


Figure 9. Receipt of benefits during upbringing

Regional trends

The survey responses show members who received benefits from means testing and those that did not seem to be equal in measure (50% receiving benefits, 49% not receiving benefits and 1% not sure). If respondents that grew up outside the UK are excluded (due to potentially different criteria), 51% of respondents received means-tested benefits (Table 2).

There are some regional variations for receipt of benefits during childhood. The highest proportion of those receiving benefits were in the West Midlands (68%) followed by Yorkshire and the Humber (60%). Of respondents who grew up overseas, 69% did not receive benefits.

Table 2. Receipt of benefits and region of childhood

| | Yes | No | Not sure | n |
|--------------------------|--------------|--------------|-------------|-------------|
| East Midlands | 55.4% | 40.5% | 4.1% | 74 |
| Eastern England | 46.3% | 53.7% | 0.0% | 41 |
| London | 55.3% | 42.6% | 2.1% | 94 |
| North East | 51.4% | 47.1% | 1.4% | 70 |
| North West | 47.5% | 52.5% | 0.0% | 179 |
| Northern Ireland | 38.9% | 61.1% | 0.0% | 18 |
| Other | 62.5% | 0.0% | 37.5% | 8 |
| Outside the UK | 29.3% | 68.5% | 2.2% | 92 |
| Scotland | 44.7% | 53.3% | 2.0% | 150 |
| South East | 47.1% | 51.9% | 1.1% | 187 |
| South West | 47.9% | 50.7% | 1.4% | 73 |
| Wales | 57.1% | 39.7% | 3.2% | 63 |
| West Midlands | 67.6% | 29.4% | 2.9% | 68 |
| Yorkshire and the Humber | 60.0% | 38.0% | 2.0% | 100 |
| Total | 51.3% | 47.1% | 1.6% | 1125 |

The regions of childhood show little correlation with the nature of parental education. In all regions 50% or more of respondents had neither parent attend university (Table 3). Respondents who grew up outside of the UK and in the South West were most likely to have both parents attend university (25% and 22% respectively). This is followed by Scotland and the South East (19% and 18%). The survey did not account for children in a single parent family.

Table 3. Region of childhood and parental education. *Average age calculated from middle of age band, assuming average of 21 for under 25 years band and 68 years for over 65 years age band

| | Parent that attended university | | | | n | Average age of respondents* |
|--------------------------|---------------------------------|--------|-------|---------|-----|-----------------------------|
| | Mother | Father | Both | Neither | | |
| East Midlands | 6.8% | 8.1% | 13.5% | 71.6% | 74 | 49.47 |
| Eastern England | 0.0% | 31.7% | 12.2% | 56.1% | 41 | 46.41 |
| London | 6.4% | 17.0% | 12.8% | 63.8% | 94 | 49.02 |
| North East | 2.9% | 12.9% | 11.4% | 72.9% | 70 | 46.14 |
| North West | 5.6% | 15.1% | 13.4% | 65.9% | 179 | 47.73 |
| Northern Ireland | 0.0% | 27.8% | 5.6% | 66.7% | 18 | 42.50 |
| Scotland | 9.3% | 20.0% | 18.7% | 52.0% | 150 | 40.30 |
| South East | 2.7% | 15.5% | 18.2% | 63.6% | 187 | 48.51 |
| South West | 4.1% | 9.6% | 21.9% | 64.4% | 73 | 46.40 |
| Wales | 3.2% | 9.5% | 12.7% | 74.6% | 63 | 46.14 |
| West Midlands | 2.9% | 10.3% | 10.3% | 76.5% | 68 | 49.03 |
| Yorkshire and the Humber | 7.0% | 14.0% | 12.0% | 67.0% | 100 | 47.21 |
| Outside the UK | 0.0% | 25.0% | 25.0% | 50.0% | 8 | 54.13 |

Analysis of responses by age clearly shows that over the past decades, the likelihood of one or both parents attending university has increased in recent decades (Figure 10).

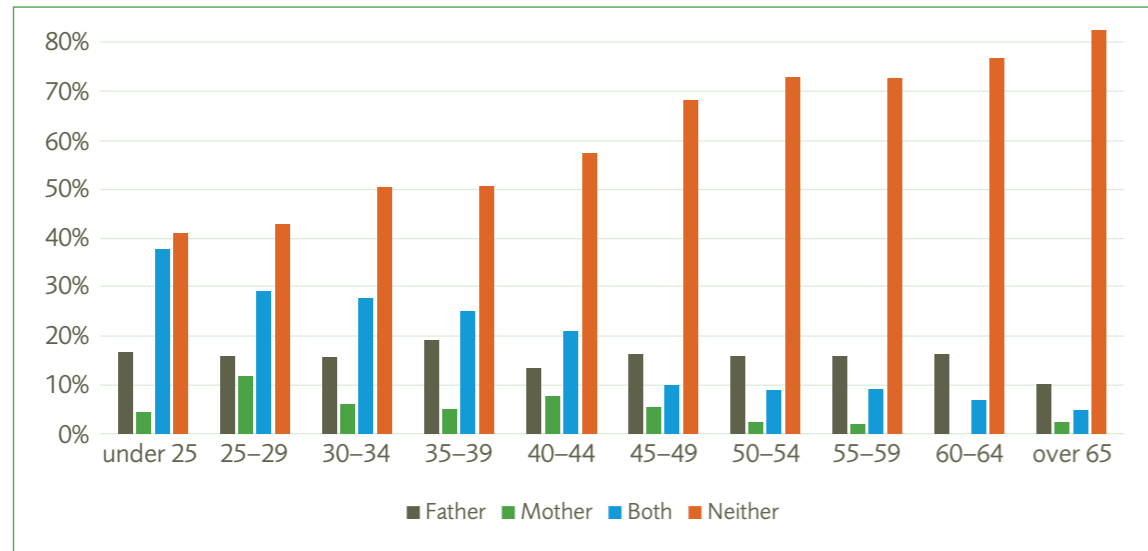


Figure 10. Relationship between age and parental university education

There is little clear evidence for any relationship between the region where respondents grew up, and the region where they attended university (Table 4). However, those who spent their childhood in Scotland were most likely to attend university there. In this case, 86.8% of all those who grew up in Scotland attended a Scottish university. For those that did not attend university in the same region, the majority moved to a nearby region. The exception to this is those who grew up in the East Midlands and East of England, where there is a lower population density and in the case of Eastern England, fewer universities. People who grew up in the South East were most likely to move to another location and go further from home.

This report acknowledges that information that identifies the socio-economic profile of respondents is limited. The Engineering UK briefing on social mobility⁹ indicates that 24% of the engineering workforce are from low socio-economic backgrounds. This analysis was based on a greater breakdown of benefits (including the specific eligibility for free school meals) and POLAR4 quintile data.¹⁰

Table 4. Region of childhood and region of university attendance

| Region of childhood | Region of childhood | | Region of university | | | | | | | | | | | | |
|--------------------------|---------------------|---------------------|----------------------|---------------|-----------------|--------|------------|------------|------------------|-------|----------|------------|------------|-------|---------------|
| | Region of childhood | Region of childhood | Total | East Midlands | Eastern England | London | North East | North West | Northern Ireland | Other | Scotland | South East | South West | Wales | West Midlands |
| East Midlands | 74 | 2 | 72 | 18.1% | 8.3% | 11.1% | 4.2% | 6.9% | 0.0% | 0.0% | 4.2% | 5.6% | 2.8% | 12.5% | 26.4% |
| Eastern England | 41 | 0 | 41 | 17.1% | 9.8% | 14.6% | 2.4% | 9.8% | 0.0% | 2.4% | 2.4% | 4.9% | 2.4% | 14.6% | 17.1% |
| London | 93 | 2 | 91 | 14.3% | 3.3% | 27.5% | 2.2% | 7.7% | 0.0% | 1.1% | 6.6% | 3.3% | 2.2% | 18.7% | 6.6% |
| North East | 70 | 0 | 70 | 12.9% | 7.1% | 7.1% | 27.1% | 7.1% | 0.0% | 5.7% | 1.4% | 1.4% | 1.4% | 5.7% | 18.6% |
| North West | 176 | 2 | 174 | 10.3% | 6.3% | 8.0% | 11.5% | 17.8% | 0.0% | 1.7% | 2.3% | 4.0% | 3.4% | 13.8% | 16.7% |
| Northern Ireland | 18 | 0 | 18 | 11.1% | 5.6% | 0.0% | 11.1% | 5.6% | 50.0% | 0.0% | 0.0% | 0.0% | 0.0% | 16.7% | 0.0% |
| Other | 8 | 0 | 8 | 12.5% | 12.5% | 12.5% | 0.0% | 12.5% | 12.5% | 0.0% | 12.5% | 0.0% | 0.0% | 12.5% | 0.0% |
| Outside the UK | 90 | 0 | 90 | 4.4% | 4.4% | 8.9% | 3.3% | 3.3% | 0.0% | 1.1% | 2.2% | 1.1% | 3.3% | 3.3% | 3.3% |
| Scotland | 147 | 3 | 144 | 0.7% | 1.4% | 1.4% | 2.8% | 2.8% | 0.7% | 86.8% | 0.7% | 0.0% | 0.0% | 0.7% | 1.4% |
| South East | 184 | 0 | 184 | 13.6% | 10.9% | 12.5% | 4.9% | 7.6% | 0.0% | 1.1% | 6.0% | 10.9% | 6.5% | 12.0% | 10.9% |
| South West | 71 | 0 | 71 | 15.5% | 12.7% | 5.6% | 1.4% | 2.8% | 0.0% | 0.0% | 12.7% | 15.5% | 5.6% | 15.5% | 11.3% |
| Wales | 61 | 0 | 61 | 11.5% | 4.9% | 9.8% | 3.3% | 11.5% | 0.0% | 0.0% | 1.6% | 14.8% | 27.9% | 8.2% | 3.3% |
| West Midlands | 68 | 1 | 67 | 19.4% | 4.5% | 3.0% | 1.5% | 13.4% | 0.0% | 0.0% | 3.0% | 7.5% | 4.5% | 32.8% | 10.4% |
| Yorkshire and the Humber | 98 | 0 | 98 | 15.3% | 13.3% | 6.1% | 14.3% | 11.2% | 0.0% | 2.0% | 3.1% | 3.1% | 1.0% | 5.1% | 22.4% |
| | 1199 | 10 | 1209 | | | | | | | | | | | | |

⁹ Engineering UK, November 2018, Social mobility in engineering, <http://bit.ly/2PHq2WA>

¹⁰ POLAR4: The participation of local areas (POLAR) classification groups areas in the UK based on the proportion of 18-year olds that participate in higher education. Local areas are classified into five groups from quintile one areas, with the lowest young participation (most disadvantaged), up to quintile five areas with the highest rates (most advantaged). POLAR4 represents the most recent data. <http://bit.ly/2GmMDZ4>

University education

Parental education

It is widely recognised that parental experience plays an important role in their children's careers. There is a clear trend that in the older age groups, parents were less likely to undertake higher education (Figure 8). Over 82% of respondents in the over-65 age group had neither parent attend university. In comparison, only 41% of the under-25 age group had neither parent attend university. There is a similar increase in the number of respondents who had both parents attend university, rising from 5% in the over-65 age category to 38% in the under-25 age category.

When parental education is compared against the social class during childhood, it is not surprising that over 91% of respondents who self-selected as working class did not have a parent who attended university. This is compared to 61% and 29% in the lower and upper middle class categories respectively. There is no reliable data from the upper class category due to the small number of respondents who identified as being in this category (n=3).

Personal education

University

Traditionally, chemical engineering starts with a university education. Of the 1,226 respondents who answered the question, 1,209 attended university (98.6%). All respondents under the age of 40 attended university (n = 424). Of those aged between 40 and 65, only 1% did not attend university. Of the people who did not attend university, 71% of these were aged over 65. This is indicative of the changes in the education system.

There is no correlation between social class during childhood and the type of university attended (ie Russell Group, former polytechnic, or new universities). If the universities are analysed using the QS World Rankings of the top 200 chemical engineering departments¹¹ there is a relatively small difference between working class or lower middle class backgrounds attending a top ranked university in comparison to upper middle class respondents with the exception of those that attended top tier universities (Figure 11). Of the respondents who identified as working class, 10.6% attended a top ranked university¹². This compares to 16.5% and 24.1% of lower middle class and upper middle class respondents respectively.

For the other tiers of ranking there is a less notable difference but for those not ranked in the top 200, 35.6% of working class respondents attended a non-ranked university compared to 26.3% and 21.2% lower middle class and upper middle class respondents respectively.

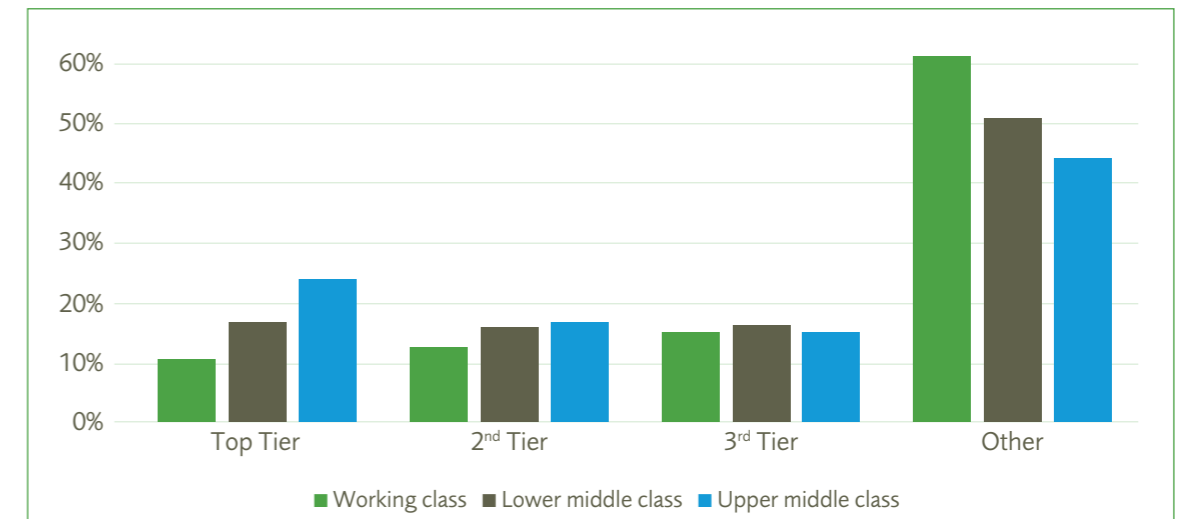


Figure 11. University tier

The survey does not provide information on the reason why an individual attended a particular university. These may be related to academic attainment but could also be related to geography or culture.

Highest qualification

The results from the 2017 survey reflect the information obtained through the 2016 survey where the older age groups are more likely to have obtained a Bachelor's degree prior to employment (Figure 12). Changes in education and requirements means that the younger age groups are more likely to have a Master's degree prior to gaining employment. The percentage of respondents obtaining a Doctorate prior to entering employment fluctuates across the age groups.

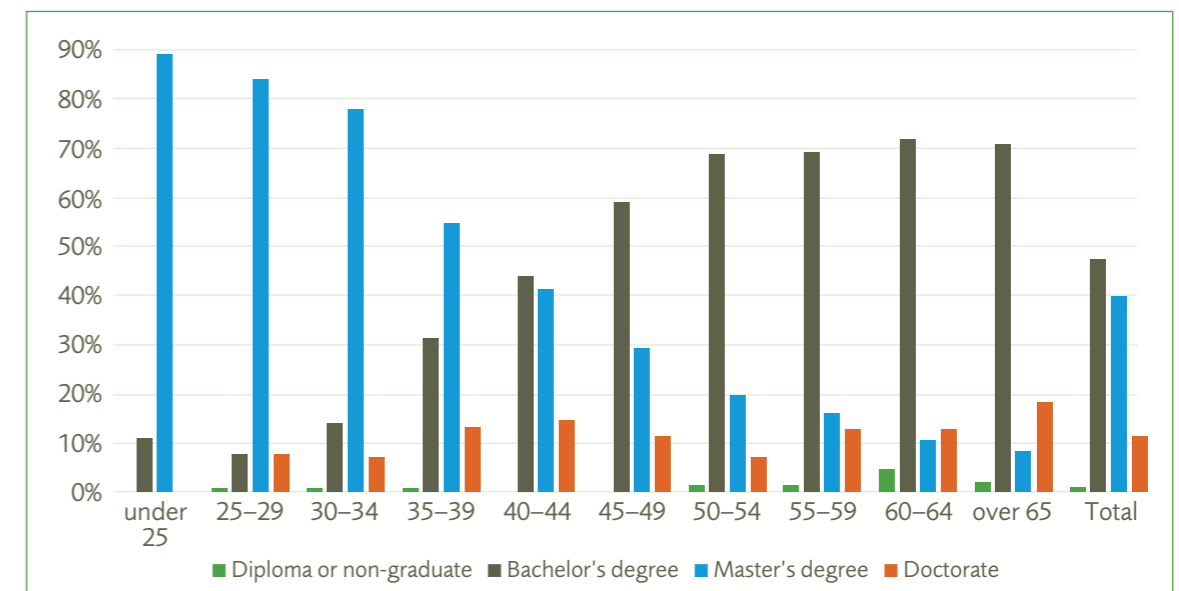


Figure 12. Highest qualification achieved for different respondent age groups

The changes in the education system make it difficult to determine whether class during childhood has any impact on the level of qualification obtained prior to employment. The data indicates that 51% of working class respondents obtained a Bachelor's degree while 35% gained a Master's and 12% a Doctorate. This compares to 43% and 46% of upper middle class respondents gaining a Bachelor's and Master's degree respectively.

Analysis of qualification by age and class shows that working class respondents over the age of 40 were more likely to have a Bachelor's degree prior to employment than lower middle class (Figure 13, Figure 14 and Figure 15). The level of academic attainment has increased, with a Master's level qualification becoming mainstream in chemical engineers under the age of 40.



Figure 13. Bachelor's degree as highest qualification prior to employment

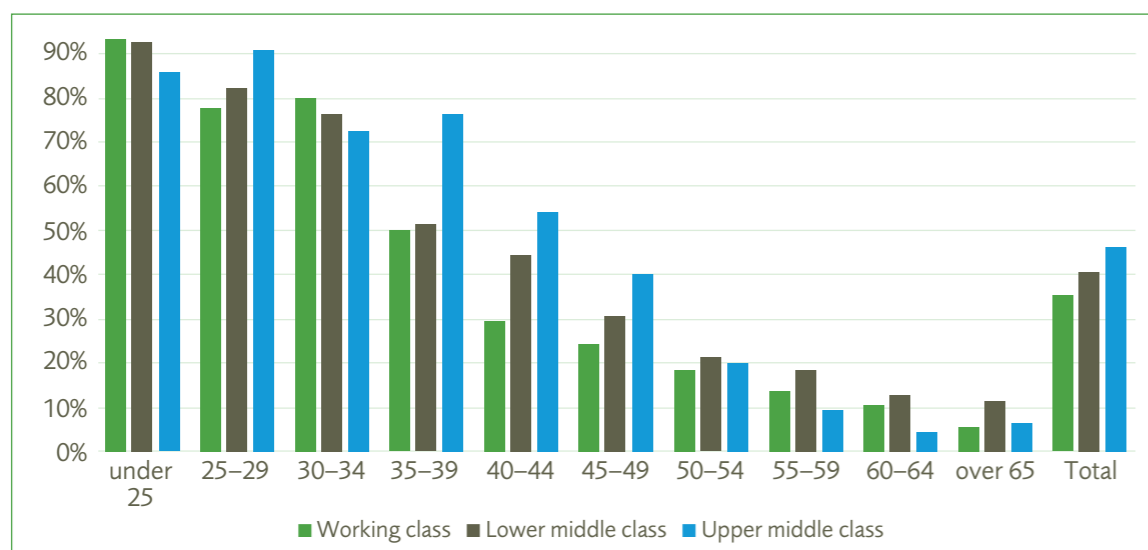


Figure 14. Master's degree as highest qualification prior to employment

If the data is analysed against age, there is no notable difference in the accessibility of Doctorate qualifications depending on class except for those aged over 65 years.

77% of respondents obtained some form of work experience relevant to chemical engineering during their first degree.

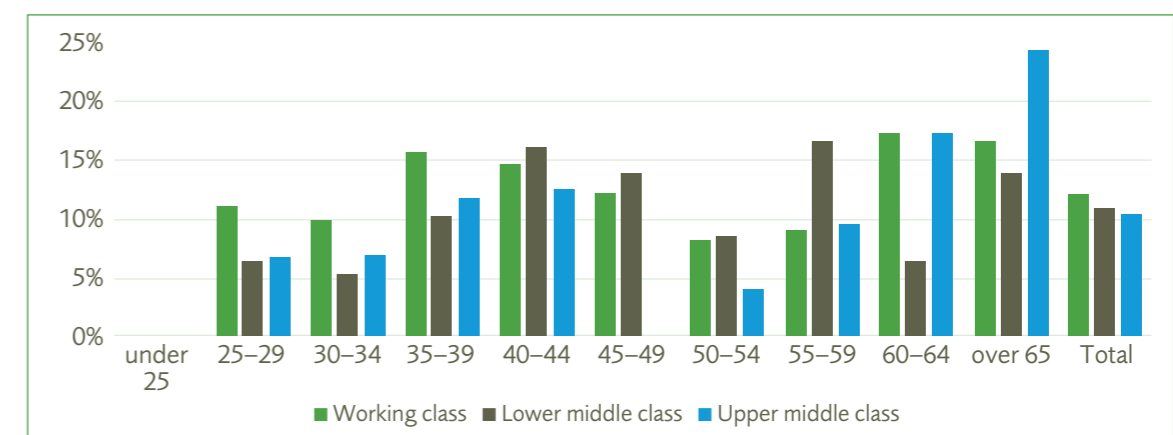


Figure 15. Doctorate as highest qualification prior to employment

Work experience

The data shows that 77% of respondents obtained some form of work experience relevant to chemical engineering during their first degree. This may have been a summer placement, internship or a year-in-industry placement. The data shows no correlation between class or receipt of means-tested benefits and whether a person gained work experience. This aligns with the 2016 survey data and indicates that work experience helped obtain employment irrespective of class. However, there is little difference in the percentage of those who gained experience currently working in a chemical engineering role compared with those who did not (Table 5).

Table 5. Comparison of those who gained work experience prior to employment and those who did not

| | Obtained work experience | | Did not obtain work experience | |
|--|--------------------------|-------------|--------------------------------|-------------|
| | n | % | n | % |
| Working in chemical engineering role | 639 | 68% | 174 | 69% |
| Working in a non-chemical engineering role | 124 | 13% | 32 | 13% |
| Not working – unemployed | 94 | 10% | 31 | 12% |
| Not working – retired or on a career break | 82 | 9% | 17 | 7% |
| Total | 943 | 100% | 256 | 100% |

Respondents shared the view that a poor social background at school age can impact school grades and access to higher-ranking universities.

It should be noted that the number of respondents without work experience was significantly lower and could be an indicator that those without work experience are less likely to pursue a role in chemical engineering or sectors that employ chemical engineering and therefore may not maintain their membership of IChemE.

The experience of respondents in entering employment strongly demonstrate the benefit of getting work experience. Of the respondents

who gained work experience, 72% entered employment immediately after completing education and 87% had entered employment within six months (Table 6). In comparison, only 52% of those that did not gain work experience entered employment immediately and 73% within six months. This confirms the view that gaining work experience during university significantly helps with getting a job. The evidence suggests that work experience is not disproportionately more or less accessible depending on social class. This supports the hypothesis that university provides fairer access to opportunities for people from different social backgrounds; as found in the 2016 report findings and reinforced here. It is important to note however, that the survey provided respondents an opportunity to share comments about how social background has held them back. There were a significant number of responses that shared a view that a poor social background at school age can impact school grades and access to higher-ranking universities. It is also recognised by chemical engineers that work experience and graduate employment can be affected by university because some employers have preferred universities for targeted recruitment and potentially strong alumni links. This could impact the opportunity for work experience, although this was not explored in the survey.

Table 6. Time taken to gain employment after completing education and relation to work experience

| | Obtained work experience | | Did not obtain work experience | |
|---|--------------------------|-------------|--------------------------------|-------------|
| | n | % | n | % |
| Immediately | 460 | 72% | 91 | 52% |
| Within six months | 99 | 15% | 37 | 21% |
| Within one year | 32 | 5% | 11 | 6% |
| Within 18 months | 10 | 2% | 7 | 4% |
| Longer than 18 months | 11 | 2% | 12 | 7% |
| First job was not in chemical engineering | 27 | 4% | 16 | 9% |
| | 639 | 100% | 174 | 100% |

Working as a chemical engineer

The survey asked a series of questions regarding starting a career (after education and training) and the nature of roles, responsibilities, size of company and sectors. The most significant finding is the type of role that respondents pursue and its relationship with social background.

Respondents from a working class background are more likely to be involved in research and development (R&D) or a teaching career (2% and 1% respectively) than those from other backgrounds (7% and 4% respectively). Similarly, respondents from a working class or lower middle class background were slightly more likely to pursue an operational or project career path (33% and 34%) compared with those from an upper middle class background (20%).

The results do not indicate any significant trends in relation to social mobility and so will not be discussed further here but can be found in Appendix C.

Professional registration and development

Of the survey respondents, those under the age of 30 are less likely to be Chartered, with 79% of respondents in this age group working towards it. This is most likely due to lack of experience.

Of all respondents, 74% of those who received means-tested benefits were Chartered (n=450) compared to only 64% (n=382) of those who did not (Table 7). The analysis by social background did not show any significant difference, although 64% of upper middle class respondents were Chartered Chemical Engineers, but 72% of working class and 71% lower middle class had obtained this professional registration.

Table 7. Analysis of Chartered status based on social background

| | Social background during childhood | | | Receipt of means-tested benefits during school and/or university | | |
|--|------------------------------------|--------------------|--------------------|--|------------|-----------|
| | Working class | Lower middle class | Upper middle class | Yes | No | Not Sure |
| Yes, I'm Chartered | 72% | 71% | 64% | 74% | 64% | 63% |
| No, I'm working towards getting Chartered or plan to in the future | 21% | 22% | 27% | 16% | 28% | 38% |
| No, I have another professional registration | 2% | 2% | 3% | 2% | 2% | 0% |
| No, I have no intention of getting Chartered | 5% | 4% | 6% | 5% | 5% | 0% |
| No, I am currently unable to get Chartered | 1% | 1% | 0% | 1% | 1% | 0% |
| Total | 394 | 506 | 269 | 596 | 589 | 24 |

There was no notable difference in the time it took to get Chartered (after starting relevant employment) across the different social classes. Most people take 5–7 years, but it is important to recognise that Chartered Engineer status is based on competency and not on age.

There is also no correlation between social class during childhood and whether an individual was more likely to undertake study for further academic qualifications once in employment.

Reflection on career

Career progression

In terms of career progression, of the respondents that answered, 17% of men and 23% of women were not satisfied with career progression to date. There was little difference in this satisfaction across social class during childhood, with those not satisfied with career progression being 21%, 18% and 15% for working class, lower middle class, upper middle class respectively (Figure 16). Similarly, analysis against receipt of benefits in childhood did not show any difference in satisfaction with career progression. The upper class category did not have enough people to provide a reliable view and so is not included.

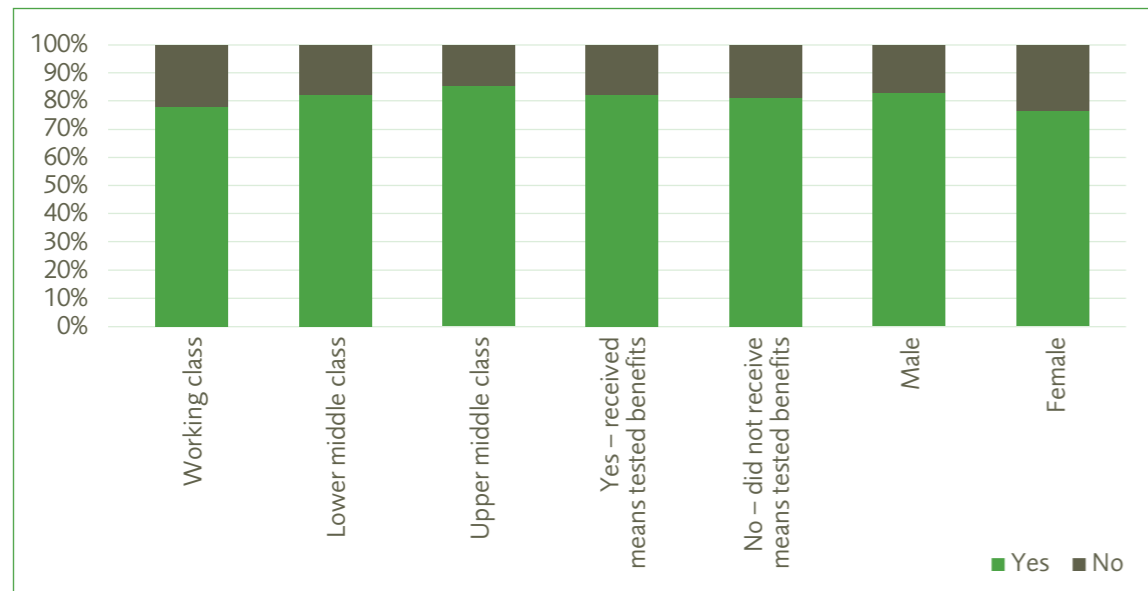


Figure 16. Satisfaction with career progression to date

Changes in social class

Respondents were asked if they thought their career had led them to change in social class. Of those that provided an answer, 45% believe this had happened, but 46% said it had not led to a change, the remaining were not sure. There was no notable difference between male and female responses but, unsurprisingly, those earlier in their career (under 30) were less likely to think their career had led to a change in class (Figure 17).

Over 76% of those who identified as having a working class childhood thought their social class had changed as a result of their career.

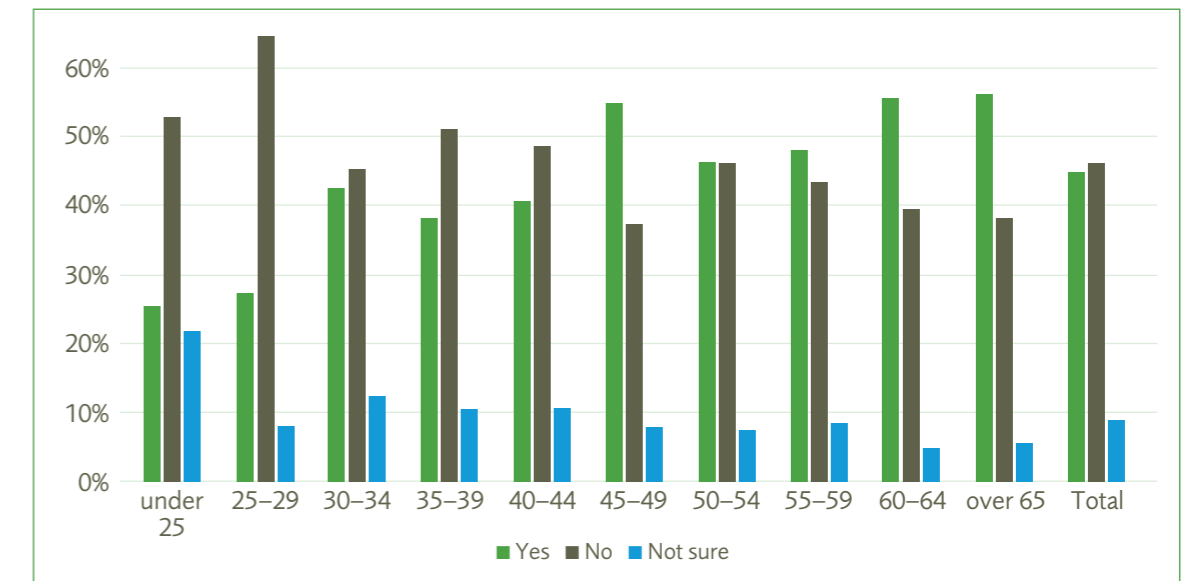


Figure 17. Perceptions of whether social class has changed as a result of career, analysis by age

There was some difference in the concept of social mobility based on class during childhood. Over 76% of those who identified as having a working class childhood thought their social class had changed as a result of their career. This is compared to 43% of lower middle class and only 8% of upper middle class respondents (Figure 18).

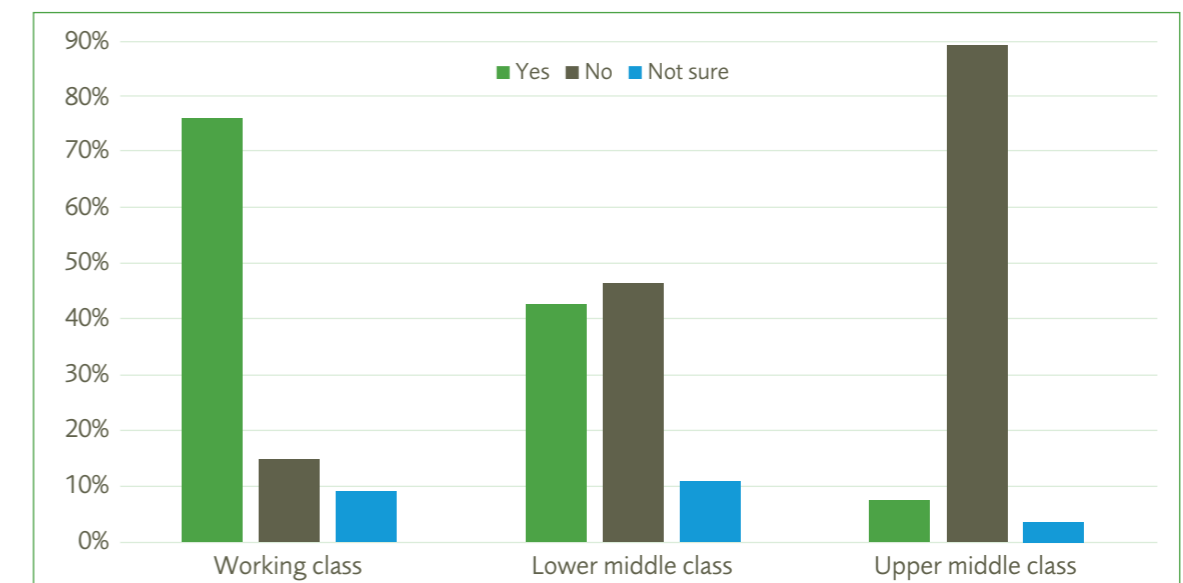


Figure 18. Perception of whether social class has changed as a result of career, analysis by social class during childhood

34% of those from a working class background believe it's becoming harder for socially disadvantaged people to succeed, a view shared by 11% of people from an upper middle class background.

When social mobility perception is analysed against receipt of benefits during childhood, 56% of respondents who received means-tested benefits believe their social class had changed as a result of their career versus 27% who did not.

Has social class held you back?

Respondents were asked if they felt their social class had ever held them back during different periods of their life. The general view held is that all classes believe social background is more likely to be an issue in the workplace than in education (Table 8).

Table 8. Respondents perceptions of when and how social background has held them back

| | Working class | Lower middle class | Upper middle class | Total |
|---|---------------|--------------------|--------------------|-------|
| Your time in school (eg primary, secondary, further education such as sixth form college) | 27% | 21% | 28% | 25% |
| Your time in higher education (eg university) | 30% | 32% | 14% | 29% |
| Your career | 43% | 47% | 59% | 46% |

When answering the question "Based on your experiences from the beginning of your career to now, how do you think the influence of people's social background on their career has changed?" the response to each of the options was fairly similar between the means-tested and non means-tested, with one exception. When asked whether it is becoming harder for people from less advantaged backgrounds to succeed, 25% of respondents who received means-tested benefits agreed versus 16% of those who did not receive means-tested benefits (Table 9).

Respondents from a working class background are more likely to believe it is becoming harder for people from disadvantaged backgrounds to succeed (34%). Those from an upper middle class background are the least likely to believe this is the case (11%).

Table 9. Perceptions of any change in the impact of social background on career

| | Received means-tested benefits | | Did not receive means-tested benefits | |
|--|--------------------------------|-------------|---------------------------------------|-------------|
| | n | % | n | % |
| It is becoming easier for people from less advantaged backgrounds to succeed | 188 | 31% | 202 | 34% |
| It is becoming harder for people from less advantaged backgrounds to succeed | 154 | 25% | 98 | 16% |
| Not sure | 76 | 13% | 101 | 17% |
| The influence of people's background on their career has not changed over time | 152 | 25% | 153 | 26% |
| No response | 36 | 6% | 42 | 7% |
| Total | 606 | 100% | 596 | 100% |

Respondents were also given the opportunity to provide any additional comment on whether their social class affected their career. It is important to note that the responses provide a wide range of views. Some believe that a poor social background made them more determined to succeed. Others identified that pursuit of a career overseas removed any barriers that may have existed due to social background. However, over 200 people provided a response of how they believe they had been held back. (Appendix D). It is also important to acknowledge that some respondents believe that they suffer from bias/discrimination because they come from a background that is more affluent than others. Some of the main reasons for being held back included:

- inadequate schooling/poor curriculum/lack of STEM subjects/quality of teachers;
- regional accent;
- ethnic origin;
- unaware of opportunities available (lack of knowledge by parents and/or schools);
- lack of self-confidence/uncomfortable and/or inability to mix with other social classes;
- lack of money/cost of education, especially university; and
- stereotyping due to background.

Over 200 people provided a response of how they believe they had been held back by their social class.

The reasons for being held back are based on personal perception and therefore can be subject to bias. However, it is important to note the alignment with some of the key conclusions from the Engineering UK Social Mobility briefing.¹³ The conclusion that individuals from disadvantaged backgrounds are more likely to face barriers which "may inhibit" them from pursuing an engineering career includes:

- lower levels of academic attainment;
- less science capital and investment in teaching;
- negative or misperceptions of engineering (including lack of career advice); and
- poor or inconsistent access to careers advice and work experience.

Little difference was observed between classes when it came to whether geography affected their career opportunities. This is both in terms in region of childhood and current region of residence.

Regional effects – where are the opportunities?

Many chemical engineers currently reside in a region that is different to where they grew up (Table 10). The largest number of respondents grew up in the North West (15%), Scotland (12%) and the South East (15%), which are all areas with significant industry. The survey then asked people if the location where they currently reside is the same or different to where they grew up. Of the respondents who have not moved, 22% have remained in Scotland, 21% in the South East and 18% in the North West.

Table 10. Region of location current residence and relation to childhood

| | % |
|---|-------------|
| Region where I live now is DIFFERENT to where I grew up | 62% |
| Region where I live now is the SAME as where I grew up | 31% |
| No answer provided or prefer not to say | 7% |
| Total | 100% |

Of the respondents that stayed in the region where they grew up, 63% believe that where they live does influence their career opportunities, this is compared to 62% of those respondents who have moved.

Of those stayed in the same region, 71% indicated that they are happy with their career to date and 38% believe their social class has changed. This is compared to 77% of those respondents that had moved being happy with their career progression and 42% that perceive their social class has changed.

The issue of relocation due to a career identified that 63% of respondents were willing to relocate for their career (either within the UK or abroad). Of the 37% that were not willing to relocate for a job or their career, the responses were categorised, and the top three reasons were identified as family, no desire to move, and retirement. There was no significant difference in willingness to move based on social class during childhood (Table 11) although men were slightly more willing to relocate for their career than women (64% versus 59%).

Table 11. Willingness to relocate for a job/career (either within the UK or abroad)

| | Total | Male | Female | Working class | Lower middle class | Upper middle class |
|-----|-------|------|--------|---------------|--------------------|--------------------|
| Yes | 63% | 64% | 59% | 62% | 66% | 59% |
| No | 37% | 36% | 41% | 38% | 34% | 41% |

When relocation was considered not an option, women were significantly more likely to base their decision on family (74%) compared to men (41%). Significantly, family was also cited as the main reason for not considering relocation in those aged 30–55 (Figure 19).

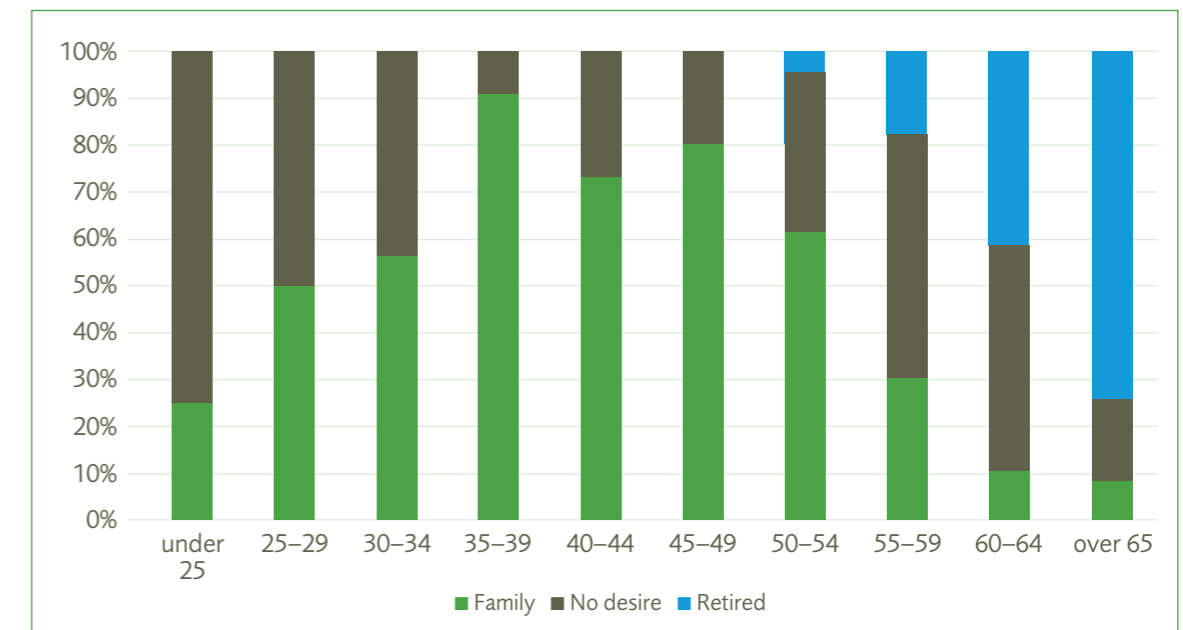


Figure 19. Reasons given for not relocating

The survey asked respondents whether they thought the area where they live influences their career opportunities. A total of 69% agreed that this was the case. There was a slight difference across the different social class during childhood and gender (Table 12).

Table 12. Does where you live influence your career opportunities?

| | Total | Male | Female | Working class | Lower middle class | Upper middle class |
|----------|-------|------|--------|---------------|--------------------|--------------------|
| Yes | 69% | 67% | 75% | 70% | 72% | 65% |
| No | 22% | 24% | 14% | 21% | 20% | 22% |
| Not sure | 9% | 9% | 11% | 9% | 8% | 13% |

The uneven distribution of industry across the UK was identified as the main influence on career opportunities. This included the fact that there are more employment opportunities in the South East and primarily London, and that clusters outside of London are more limited in terms of industry sector and career progression. Examples identified were the oil and gas 'hotspot' in Aberdeen and the process industries clustered in the North West and North East.

In some regions where there is less industry it clearly correlates that there are fewer opportunities. This was identified not just in terms of access to different career opportunities, but also through the impact on young people's awareness of career options of less exposure to chemical engineering and the career opportunities it presents.

Conclusions

Creating a more equal society is important to help realise social and economic benefits. In the 21st Century, engineering will continue to play an important role in creating, maintaining and enhancing quality of life. In realising new technologies, the chemical engineering discipline will change and adapt. It is well recognised that there is a need for more skills in the engineering sector. This includes more practitioners and new skills. Addressing matters of equality, diversity and inclusion not only support a better social construct but will help provide the techno-economic benefits that also support a better society. Understanding and addressing social mobility plays a part in this.

To address social mobility, it must first be understood. Social mobility is a complex issue and there are many challenges in identifying, categorising and analysing its presence and influence.

IChemE's member-led DIWG identified social mobility as an issue of relevance and concern to members. Since 2015, the Social Mobility sub group has conducted work with members to better understand matters of social mobility across the discipline within the UK.

This survey aimed to understand the role of chemical engineering in social mobility. It received input from more than 1,200 IChemE members and identified some clear trends but still has areas where there is insufficient data. It is important to note that this survey relied on self-classification of individuals social class and no criteria was provided to guide this self-identification.

There are complex ways in which the aspects of social mobility interact. The Social Mobility Working Group analysed four factors in relation to social mobility:

- social background;
- gender and ethnicity;
- location; and
- educational and professional attainment.

Social background

Overall, chemical engineering is seen by its members as a profession where upward social mobility is possible. Almost 75% of respondents identified themselves as coming from a working or lower middle

class background. Although this is self-reporting, it is supported through the additional questions such as parental education. Almost 50% of the respondents received some type of means-tested benefits during childhood. Almost 90% of these were from a working class or lower middle class background. For respondents under 30, people from working or lower middle class background joining the profession drops to 67% from an average of 76% above 30. Some of this change is due to the dramatic rise over the decades in people attending university. Similarly, there has been an overall increase in professional roles in comparison to traditional working class jobs, although the decrease for people under 30 is not fully understood.

Receipt of means-tested benefits and social background do not appear to influence whether a respondent was able to obtain work experience. This supports a conclusion in the 2016 report that once at university there is more equality of opportunity.

Gender and ethnicity

Demographically, while there is still room for improvement, IChemE membership is becoming more representative of the UK population. Female participation has increased to 28% for members under 25 (excluding students). Of those that identified as male or female, 78% were male and 22% female. In comparison, the profile of IChemE's non-undergraduate UK membership is 81% male and 19% female. It reflects the trend that female participation in the profession has gradually increased over the last several decades. Similarly, black and minority ethnic (BME) participation has increased to 9%.

The chemical engineering profession is diverse but has the opportunity to be more representative of the general UK population. IChemE has an opportunity to increase its efforts to include more women and BME people in the chemical engineering profession. This not only applies to recruitment and exposure to the industry but also increasing retainment through various diversity and inclusion initiatives within the industry.

Location

The chemical engineering profession is clustered in specific regions across the UK. While members grew up all over the UK, areas in which the industry is clustered are over-represented in the backgrounds of the IChemE membership in comparison to the general population. The largest number of respondents grew up in the North West, Scotland or the South East, and these (typically) were the locations where respondents moved to, if they relocated. This supports the idea that exposure to industry while young encourages more people to enter the profession.

Just over 60% believe that where you live does influence their career opportunities. This is reflected in the fact that 62% of respondents have moved from where they grew up. A majority of these moved to either the South East, Scotland or the North West. Respondents that have relocated are more likely to believe their social class has changed but may be less content with their career.

Educational and professional attainment

The 2017 results show that obtaining a university degree from an IChemE-accredited university (regardless of the university's prestige) can provide greater equality of opportunity. Once entering the workforce, the data shows that potential earnings and levels of responsibility are independent of social class. In fact, a majority of respondents from low-income backgrounds believe that their social class has risen since joining the profession.

Although not a social mobility indicator, the results of the survey demonstrate that work experience while studying improves access to employment.

Those respondents who received means-tested benefits were more likely to become a Chartered Chemical Engineer and more likely to earn salaries at the upper end of the scale. This is possibly due to a drive or desire for self-improvement. Many chemical engineers identify as sole traders or as being self-employed. These individuals are more likely to pursue and achieve professional registration, presumably to improve their credentials.

A career in chemical engineering is a vehicle for social mobility

It is important to acknowledge that the results from this survey complement and reinforce some of the main conclusions from the 2016 report. There is good evidence to support the conclusion that a career in chemical engineering is a good vehicle for social mobility:

- earnings appear to be independent of the social class during childhood;
- there is little difference in career satisfaction based on social class during childhood;
- there is no clear evidence of chemical engineers achieving differing levels of responsibility in their careers based on their social class during childhood; and
- of the total respondents, 42% (the majority being from the working or lower middle class) indicated that they felt their social class had changed as a result of their career in chemical engineering. This is reflected by over 50% of respondents who received means-tested benefits believe their social background has changed due to their career.

Overall, the data show that earnings are independent of social class, as is level of responsibility. People who received means-tested benefits while growing up were more likely to earn over £100,000 (22%) than those who did not (17%). Similarly, they were less likely to earn under £30,000 (11% compared to 15%).

The majority of respondents had started their journey in chemical engineering by studying for a degree at university. There is little evidence of a relationship between social class during childhood and the career path taken. However, it is observed that respondents from working class and lower middle class backgrounds were slightly more likely to pursue an operational or project career path (33% and 34%) compared with those from an upper middle class background (20%).

How this is relevant to IChemE?

IChemE is a professional body that is led by members, supports members and serves society. Within this is the need to support the education, training and lifelong development of chemical engineers. It is well recognised that the UK has a demand for engineering skills¹⁴ and that a diverse workforce is more productive and innovative.

IChemE will play its part in supporting a profession that is accessible to all those who choose to pursue it. This goes across all aspects of diversity and inclusion including social background. In 2019, IChemE is looking to develop improved diversity data monitoring within membership and applications for membership. This will enable the Institution to monitor the membership demographic and application processes, to identify areas of bias, and identify areas where improvement may be needed. Through the continued monitoring of social background of members and other available data it will also be possible to assess a chemical engineering career as an enabler for social mobility.

Within the survey, several areas have been identified where amendments to questions may provide better information. For example, the survey did not take account of single-parent families in childhood and did not differentiate between school-age means-tested benefits and the benefit received in the form of a student loan while at university.

In addition to awareness of diversity and inclusion, the results of the survey clearly indicate that younger chemical engineers are increasingly entering non-chemical engineering roles. While this may be partly due to how people classify their roles, this reflects the recent step change in demand for 'traditional' chemical engineers.

Opportunities for the profession

The survey shows that chemical engineering is a vehicle to improve social mobility. However, there is still opportunity to more accurately reflect the society we live in, including social mobility. There is no clear agreement regarding whether it is becoming easier or more difficult for people from a disadvantaged background to succeed. This issue should therefore continue to be studied in the future. However, there is agreement from respondents of all classes, who believe social background is more likely to be an issue in the workplace than in education. This is especially true of the working class.

Areas already identified for continued progress are:

- to promote awareness, understanding and access to the profession and its opportunities particularly in regions where
 - there is lower presence of the industries that employ chemical engineers
 - there is regional deprivation and limited resources to inform students, educators and parents
- promote awareness of unconscious bias to reduce possible discrimination in the workplace based on background (social or other)
- to increase the number of women and other minority groups in the profession.

Acknowledgement

This work has been led and developed through the hard work of IChemE members in the Diversity and Inclusion Working Group. The report preparation was led by Brian Smith and Wendy Wilson, with support from IChemE staff Jacob Ohrvik-Stott and Alana Collis.

¹⁴ Engineering UK, 2018, *Engineering UK Report: the state of engineering*, <http://bit.ly/2SzflHF>

Appendix A: survey questions

1. How old are you?

- Under 25
- 25–29
- 30–34
- 35–39
- 40–44
- 45–49
- 50–54
- 55–59
- 60–64
- Over 65
- Prefer not to say

2. What is your gender?

- Male
- Female
- Other
- Prefer not to say

3. What is your ethnicity?

- White
- Asian/Asian British
- Black/African/Caribbean/Black British
- Mixed/Multiple ethnic groups
- Other
- Prefer not to say

4. What area of the UK did you primarily grow up in?

- East Midlands
- Eastern England
- London
- North East
- North West
- Northern Ireland
- Scotland
- South East
- South West
- Wales
- West Midlands
- Yorkshire and the Humber
- Other
- Outside the UK
- Prefer not to say

5. How would you define your social background growing up?

- Working class
- Lower middle class
- Upper middle class
- Upper class
- Prefer not to say

6. During your school and/or university years, did your household receive any means-tested benefits (eg free school meals, income support, university grant etc)?

- Yes
- No
- Not sure

7. Did your parent(s) or guardian(s) go to university?

- Mother
- Father
- Both
- Neither

8. Did you attend university?

- Yes
- No

9. What university did you attend to complete your first degree? (select Other if outside of the UK)

- Top tier
- 2nd tier
- 3rd tier
- Other
- None UK
- No response

10. University name

11. What is the highest qualification you attained prior to beginning employment?

- Diploma or non-graduate
- Bachelor's degree
- Master's degree
- Doctorate

12. Did you obtain work experience relevant to chemical engineering during your first degree? (eg summer placement, year in industry, internship)?

- Yes
- No

13. Following completion of your first degree, when (if at all) did you secure employment in a chemical engineering role?

- Immediately
- Within six months
- Within one year
- Within 18 months
- Longer than 18 months
- I did not work in a chemical engineering role following completion of my first degree

14. Are you currently employed in a chemical engineering role?

- Yes
- No, I am currently retired or on a career break
- No, I work in a non-chemical engineering role
- No, I am currently unemployed

15. What career path have you primarily taken?

- Commercial
- Consulting
- Contracting
- Managerial
- Marketing & sales
- Not applicable
- Operational
- Other (please specify)
- Process safety/HSE
- Projects
- Regulatory
- Research and development
- Teaching (including academic research)
- Technical

16. Are you a Chartered Chemical Engineer?

- Yes, I'm Chartered
- No, I am currently unable to get Chartered
- No, I have another professional registration
- No, I have no intention of getting Chartered
- No, I'm working towards getting Chartered or plan to in the future

17. How long did it take you to become Chartered after starting relevant employment?

- Less than 5 years
- 5–7 years
- 8–10 years
- More than 10 years

18. What size organisation do you currently (or did most recently) work for?

- Sole trader/self-employed
- Micro: 0–9 employees
- Small: 10–49 employees
- Medium: 50–249 employees
- Large: 250+ employees
- Not applicable

19. What is (or most recently was) your annual salary before tax (in GBP)?

- Less than 10,000
- 15,000–24,999
- 25,000–29,999
- 30,000–34,999
- 35,000–39,999
- 40,000–44,999
- 45,000–49,999
- 50,000–59,999
- 60,000–79,999
- 80,000–99,999
- 100,000 and over
- Not applicable
- Prefer not to say

20. What sector do you currently (or did most recently) work in?

- Private (eg corporations, small enterprise)
- Public (eg government, universities)
- Voluntary/third sector (eg charities, social enterprises)
- Other (please specify)
- Not applicable

21. How long have you been (or were you previously) in paid employment?

- Less than 5 years
- 5–9 years
- 10–14 years
- 15–19 years
- 20–24 years
- 25–29 years
- 30–34 years
- 35 years and over
- Not applicable

22. Have you undertaken any further academic qualifications while employed? (please tick all that apply)

- Yes – Bachelor's degree
- Yes – Master's degree
- Yes – Doctorate
- Yes – MBA
- No
- Other (please specify)

23. Which of the following responsibilities do you hold (or have previously held), during your career (excluding voluntary work)?

- Leadership (ie responsible for large teams with team leaders reporting to you)
- Manager/supervisor (ie one or more colleagues reporting to you)
- Project manager (ie holding overall responsibility for planning, resourcing and delivering a project or turnaround)
- Subject matter expert/specialist
- External representative (ie representing organisation at local or international level at external events such as conferences)
- Senior executive (ie C-Suite or board-level responsibilities)
- Not applicable

24. Are you happy with your career progression to date?

- Yes
- No

25. In which of the following areas (if any) do you feel your social background has ever held you back in? (Please tick all that apply)

- Your career
- Your time in further education (eg university)
- Your time in school (eg primary, secondary, higher education such as sixth-form college)
- Prefer not to say
- No

26. If you feel your social background has held you back in any of the areas listed in the previous question, why?

27. Do you think your social class has changed as a result of your career?

- Yes
- No
- Not sure

28. Based on your experiences from the beginning of your career to now, how do you think the influence of people's social background on their career has changed?

- It is becoming easier for people from less advantaged backgrounds to succeed
- It is becoming harder for people from less advantaged backgrounds to succeed
- Not sure
- The influence of people's background on their career has not changed over time

29. What area do you currently live in?

- East Midlands
- Eastern England
- London
- North East
- North West
- Northern Ireland
- Scotland
- South East
- South West
- Wales
- West Midlands
- Yorkshire and the Humber
- Outside of the UK
- Prefer not to say
- Other

30. Do you believe that where you live influences your career opportunities?

- Yes
- No
- Not sure

Appendix B

31. If you answered Yes to the previous question, why?

32. Are you willing to relocate for your job/ career (either within the UK or abroad)?

- Yes
- No

33. If you answered No to the previous question, why?

Means testing appears to have decreased for respondents under the age of 45. Possible explanations may be the introduction of university tuition fees in 1998 and the application of means testing of maintenance loans from 2012 onwards. Changes to university grants and fees are outlined in Table 13 and Figure 20.¹⁵

Table 13. Changes in university grants

| | |
|-------|--|
| 1960s | Nationally, 12% of school leavers went to university No student loans Local education authorities paid fees in full Means-tested annual grant of up to £340 (for living costs) Fees and maintenance costs were offset against the 'resources' of student and the parents |
| 1970s | 1972: 14% of 18-year olds were in higher education By the end of 1970s, higher education participation fell to 12% 1980: grant increased to £1,430 |
| 1980s | By 1990 student funding had been cut 1989: Mortgage-style student loan introduced Grants of £2,265 available to students from poorer families with no annual increase |
| 1990s | 1990: 20% of 18-year olds in higher education 1997: University grants abolished (from September 1998) 1998: New system introduced to include £1,000 means-tested, upfront tuition fee, and low-cost income contingent loans |
| 2000s | 43% of under-30s have higher education experience 2000: Scottish government replaced tuition fee with £2,000 fee to be paid post-graduation (for Scottish students attending Scottish universities) 2002: Tuition fees: £1,100 – offset by low-cost loans of up to £3,905 2004: Tuition fees: £3,000 maximum (as an income-contingent loan) 2008: Tuition fees in Scotland abolished |
| 2010s | 2012 England tuition fees raised to up to £9000 2012: increased student loan repayment threshold to £21,000 and a variable rate of interest on loans was introduced: <ul style="list-style-type: none"> ■ RPI +3% while studying ■ RPI after graduation and under the repayment threshold (of £21,000) ■ RPI when over the threshold ■ RPI +3% for incomes over £41,000 Abolition of maintenance grants in England from 2016/17 |

¹⁵ House of Commons Library, Wilson W, Student grants, loans and tuition fees, Research Paper No 97/119, November 1997, <http://bit.ly/2MbJ4TI>

Appendix C

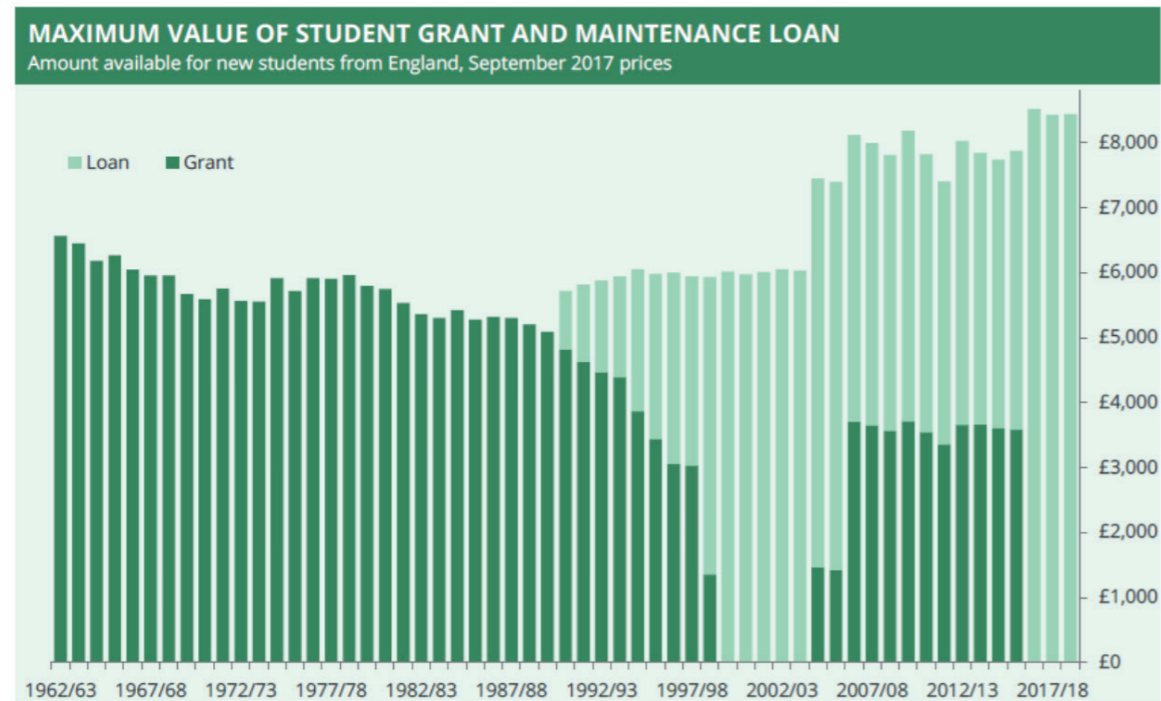


Figure 20. Maximum value of student loan grant and maintenance loan¹⁶

Working as a chemical engineer

Entering the workplace

The 2016 Social Mobility report indicated that once students were at university, there was fairer and more equal access to opportunities. Results from the 2017 survey show there is no significant difference in the time taken to gain employment based on social class of upbringing. However, data shows that unemployment in minority ethnic groups is higher than for white individuals. Similarly, the time taken to get a job following graduation is higher for minority groups.

Overall, 80% of respondents secured employment within six months of graduating (65% immediately and a further 15% within six months). It is noteworthy that this trend appears to be changing with only 68% of under-25s securing employment within six months of graduation (45% immediately / 23% within six months). As a result, 23% went to work in a non-chemical engineering field. This is compared to approximately 8% in other age groups.

Work experience is evidently an important factor in education and training with 77% of the respondents obtaining work experience. Of these, 87% gained employment in the field of chemical engineering within 6 months. This is compared to only 73% who did not obtain work experience.

The movement of respondents from the region where they grew up to another region appears to be independent of whether they work in chemical engineering or not.¹⁷

Appendix D

Perceptions of how social class has held an individual back

Some respondents believe that their social class has not held them back and, in some cases has made them more driven to succeed. However, many identified perceived issues – often related to social background – that have posed a challenge.

The following is a summary of comments provided by respondents about how their background has held them back:

General comments

- Background can influence self-confidence, which impacts ability to achieve.
- Supportive parents make a significant difference regardless of geography and social background.

Education and school-age impacts

- University opportunity is limited by the quality of education, which is a consequence of social class. For example, a poor school with limited resources and less support for academically able students.
- Excluded by social interaction with peers at school due to different backgrounds and difference in parental careers.
- The issue of parents being less able to provide additional financial support at university caused concern. This is identified as not just a working class challenge but for parents from middle class backgrounds with reasonable salaries but large mortgages and bills. In younger chemical engineers there seems to be greater stress due to competing pressures of part time work to afford living costs balanced with need for study time.
- Individuals with a better education have greater self-confidence and stronger communication skills. This supports better career progression.
- Still a significant difference in the nature of education provided at state comprehensive schools in comparison to grammar and private schools.
- Individuals from less affluent areas attend schools that are less well equipped to support interview preparation and other career support. There are fewer extra-curricular opportunities and teachers and parents have low expectations.
- Lack of awareness of exposure to different careers and opportunities including work experience.
- Conscious and unconscious bias in favour of those who attend private school and/or red brick universities (this includes university applications, career recruitment and industry recruitment for summer internships etc).
- Support in poorer areas for university applications makes it harder and less likely that people will apply and be successful in an application to attend a top university.
- Balancing financial commitments and study requirements at university can be a challenge. This can affect a wide range of individuals but has a greater impact on those from poorer backgrounds.
- Less able to afford to participate in experiences, clubs and societies at school due to low income and lack of parental support (including things such as transport to and from events).
- Some universities have less career guidance than others.

Working as a chemical engineer

- Colleagues with a perceived better background climb the ladder more quickly.
- Many employers have 'preferred universities' to recruit from that can discriminate against those from less affluent backgrounds.
- Sometimes there is a negative response to those who attend a top university such as Oxford or Cambridge or are perceived to have come from a better-off background.
- Some regions and organisations have a culture that supports those who have a family background in the region and industry.
- Some senior people in industry classify themselves as working class and treat employees from perceived upper middle class backgrounds harshly and may not accept them. This is prevalent in the more traditionally working class regions of the UK and the manufacturing industries.
- Unconscious bias and a tendency for management to recruit 'in their own image'.
- Lack of parental experience in a professional environment results in a lack of awareness of how to behave. This can make it difficult to fit in and know how to behave.
- Career opportunities and progression in the civil service and military environments are still perceived to be dependent on class background.

Other factors, not exclusively social class

- Minority ethnic groups and individuals from outside the UK feel that career progression opportunities are fewer because of their nationality and/or ethnicity. Unconscious bias can also include perception of non-British names.
- There is the challenge of being a woman in a male-dominated environment that still has patriarchal behaviours.
- Not having a father during childhood can cause challenges in education and lack of a role model.
- Concerns that those with strong regional accents are not taken seriously and are discriminated against. Some find a solution to this is to work outside the UK.
- Less likely to have contacts to support career progression.
- Poor access to work experience opportunities.
- Poor workplace culture and low pay, particularly for academics.
- Unconscious (and conscious bias) leads to stereotypes.
- Difficult when you have no family or mentors with experience in an industry sector – this can include process industries, contracting and self-employed consulting in particular.
- Financial challenges can force people to delay or not pursue education or postgraduate education with a pressure to get a job.
- Non-graduates are not given the same consideration as those with a degree.

- Lack of suitable, visible role models.
- Schools in less affluent locations are less likely to support or encourage neurodiverse students (eg those with dyslexia) in pursuit of high achieving or technical subject careers such as engineering.
- Lack of exposure to professional business environments, entrepreneurship, leadership skills and networks.
- Being provided opportunities to work on large or overseas projects.
- Opportunity to receive equal compensation for secondments and confidence to negotiate a better salary.

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Contact us for further information

UK

t: +44 (0)1788 578214

e: membersupport@icheme.org

Australia

t: +61 (0)3 9642 4494

e: austmembers@icheme.org

Malaysia

t: +603 2283 1381

e: malaysianmembers@icheme.org

New Zealand

t: +64 (4)473 4398

e: nzmembers@icheme.org

Singapore

t: +65 6250 0385

e: singaporemembers@icheme.org



www.icheme.org

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