

# TRENDS IN MATHEMATICS AND SCIENCE SUBJECT COMBINATIONS IN THE NSW HSC 2001 - 2014 BY GENDER

As an analysis of mathematics/science subject combination choices made by NSW HSC students 2001-2014, this study examines the proportions of the corresponding Year 8 cohort sizes electing to study mathematics/science subject combinations for the HSC that are suitable for entry into STEM degrees at university. Trends in the proportions of total HSC and ATAR-eligible HSC students undertaking mathematics and science study are also reported.

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# TRENDS IN MATHEMATICS AND SCIENCE SUBJECT COMBINATIONS IN THE NSW HSC 2001 - 2014 BY GENDER

## SUMMARY

This analysis provides an update on previous analyses of mathematics/science subject combination choices made by NSW HSC students. We extend the [previous Mack and Walsh report](#) by providing 2012, 2013 and 2014 data.

By reviewing 2001-2014, we show continued declines in the various maths/science combinations possible. Although the declines in individual combinations are small, overall there has been a substantial decline in the proportion of students undertaking at least one suitable mathematics course and one suitable science subject in the HSC. In 2001 some 19.7% of boys and 16.8% of girls from the corresponding Year 8 cohort went on to study a math/science combination in the HSC. However, in 2014 only 19.0% of boys and 14.1% of girls went on to study such maths/science combinations in the HSC.

The magnitude of these declines could be considered small, or marginal; however the 2001 HSC retention rates from Year 8 for males/females were 63% and 74% respectively, while in 2014 they were 71% and 80% respectively. Given these increased participation rates, the above numbers are disappointing. One might assume that increased upper secondary participation would lead to greater participation in mathematics and science; but this is not the case and in fact, since 2001 there has been no substantial growth in science participation and declines in mathematics participation. In addition, as is shown later, there are disturbing increases in the proportions

of HSC and ATAR-eligible students choosing no units of mathematics or science in Year 12. Steepest declines and lowest rates of participation are among females.

## BACKGROUND

The analysis presented here owes its development to the pioneering study by the late Barry Walsh of similar data in Victoria in the mid 1970s and subsequent NSW studies, discussed more fully in the 2013 Mack and Walsh report.<sup>1</sup>

The tables presented below use Year 8 cohort sizes by gender as the base for comparison. We do so because until there was a common transition year from Primary to Secondary education across Australia, Year 8 was the first common year at secondary level. Thus, by convention, secondary school participation rates are reported as a proportion of the Year 8 cohort.

Our study is restricted to NSW for a very simple reason. While it is easy to obtain national data on the whole Year 8 cohort, and also on the total national enrolments of recent school leavers in say Engineering degree programs, there is at present no national data base which provides data on the set of subjects chosen by each exiting school student who might subsequently have enrolled in such a program. In NSW, existing arrangements between the NSW government and the Universities Admissions Centre permit analysis of whole of cohort HSC data for research purposes such as that carried out here. With much additional work, it would be possible to track this information across secondary-tertiary transition and

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<sup>1</sup> Mack, J. & Walsh, B. (2013) Mathematics and Science Combinations: NSW HSC 2001-2011 by Gender. Technical paper, retrieved from: <http://www.maths.usyd.edu.au/u/SMS/MWW2013.pdf>

thus obtain exact data on the precise preparation level of each student entering each degree program, but at present there is no way this can be done nationally. We hope that the Chief Scientist might commission such a study nationwide, thus obtaining a national profile of the entering cohort for each field of study.

## DATA PRESENTATION

We first tabulate our data and will then comment on what has been displayed. Note that the Year 8 Cohort Number is in fact the number relevant to the year when most of the given HSC Year cohort was in Year 8. Note also that, for mathematics, we follow the terminology used in the well-known national studies by Barrington and Brown<sup>2</sup>: for NSW, ‘Advanced’ means 3unit/Extension1 or 4unit/Extension2, while ‘Intermediate’ means Mathematics 2unit. These are the calculus-based mathematics courses in the NSW HSC. The NSW General Mathematics courses, which do not include calculus, are not considered.

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<sup>2</sup> Barrington, F. (2006). Participation in Year 12 mathematics across Australia 1995-2004. Australian Mathematical Sciences Institute. Retrieved from <http://www.amsi.org.au/index.php/publications-mainmenu/78-publications/education/249-participation-in-year-12-mathematics-across-australia-1995-2004>

Barrington, F., and P. Brown. (2007)"Articulation between secondary mathematics and tertiary education programs." *National Symposium on Mathematics Education for 21st Century Engineers*. RMIT University, 7th Dec. 2007.

Barrington, F. (2013). Update on Year 12 mathematics student numbers. Australian Mathematical Sciences Institute. Retrieved from <http://www.amsi.org.au/index.php/publications-mainmenu/78-publications/education/1150-year-12-mathematics-student-numbers-2003-2012>

Table 1 shows the reference cohort numbers from which participation rates are calculated. Our primary focus is on the proportions participating from Year 8 cohorts, but we also examine HSC and ATAR cohort participation. We use ATAR as the generic acronym for TER/UAI/ATAR.

Tables 2 to 9 show the participation rates for the following:

2. ***Males Intermediate mathematics plus exactly one of the subjects biology, chemistry or physics***
3. ***Females Intermediate mathematics plus exactly one of the subjects biology, chemistry or physics.***
4. ***Males Advanced mathematics plus exactly one of the subjects biology, chemistry or physics.***
5. ***Females Advanced mathematics plus exactly one of the subjects biology, chemistry or physics.***
6. ***Males Advanced mathematics plus at least two science subjects.***
7. ***Females Advanced mathematics plus at least two science subjects.***
8. ***Males Intermediate mathematics plus at least two science subjects.***
9. ***Females Intermediate mathematics plus at least two science subjects.***

Note that an additional science subject 'Earth and Environmental Science' is offered for HSC, however the numbers are too small to be included this analysis.

*Table1: Background information on the NSW HSC and ATAR-eligible candidature sizes 2001-2014 in total and by gender.*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Corresponding Yr 8 (00)	837	845	839	845	844	854	874	879	894	880	878	876	867	866
Corresponding Yr 8 (00) males	427	431	428	431	428	435	445	450	445	449	446	446	440	440
Corresponding Yr 8 (00) females	410	414	411	414	416	419	429	433	424	431	432	430	427	426
HSC (00)	575	595	598	606	599	604	611	619	623	638	647	646	645	653
HSC (00) males	270 47%	282 47%	285 48%	289 48%	283 47%	286 47%	289 47%	293 47%	296 48%	306 48%	307 47%	310 48%	307 48%	312 48%
HSC(00) females	305 53%	313 53%	313 52%	317 52%	317 53%	318 53%	322 53%	326 53%	326 52%	333 52%	340 53%	336 52%	338 52%	341 52%
ATAR(00)	498	516	517	520	515	507	510	520	524	542	549	548	546	555
ATAR(00) males	233 47%	243 47%	273 47%	247 48%	274 47%	237 47%	237 47%	279 46%	244 47%	256 47%	256 47%	258 47%	254 46%	260 47%
ATAR(00) females	265 53%	274 53%	273 53%	273 52%	274 53%	271 53%	273 54%	279 54%	280 53%	286 53%	293 53%	290 53%	292 54%	295 53%

*Table 2: NSW HSC maths and science subject combination data 2001-2014 for males who chose an Intermediate mathematics course for their HSC and exactly one of the subjects biology, chemistry or physics.*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Yr 8 (00)	427	431	428	431	428	435	445	450	445	449	446	446	440	440
Any one science	2652 6.2%	2610 6.1%	2681 6.3%	2464 5.7%	2354 5.5%	2318 5.3%	2290 5.1%	2185 4.9%	2006 4.5%	2185 4.9%	2038 4.6%	2009 4.5%	2008 4.6%	2015 4.6%
B	917 2.1%	792 1.8%	744 1.7%	680 1.6%	668 1.6%	664 1.5%	683 1.5%	614 1.4%	567 1.3%	626 1.4%	593 1.3%	602 1.3%	576 1.3%	587 1.3%
C	380 0.8%	336 0.9%	388 0.9%	395 0.9%	424 1.1%	379 0.9%	367 0.8%	341 0.8%	328 0.7%	320 0.7%	343 0.8%	296 0.7%	318 0.7%	325 0.7%
P	1280 3.0%	1399 3.2%	1482 3.5%	1318 3.1%	1203 3.1%	1230 2.8%	1205 2.7%	1171 2.6%	1070 2.4%	1183 2.6%	1063 2.4%	1081 2.4%	1081 2.5%	1060 2.4%

*Table 3: NSW HSC maths and science subject combination data 2001-2011 for females who chose an Intermediate mathematics course for their HSC and exactly one of the subjects biology, chemistry or physics.*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Year8(00)	410	414	411	414	416	419	429	433	424	431	432	430	427	426
Any one science	2751 6.7%	2563 6.2%	2393 5.8%	2234 5.4%	2229 5.4%	2060 4.9%	2015 4.7%	1898 4.4%	1881 4.4%	1793 4.2%	1758 4.1%	1777 4.1%	1693 4.0%	1812 4.2%
B	1953 4.8%	1693 4.1%	1586 3.9%	1454 3.5%	1475 3.5%	1323 3.2%	1321 3.1%	1236 2.9%	1215 2.9%	1168 2.7%	1158 2.7%	1159 2.7%	1108 2.6%	1216 2.9%
C	496 1.2%	539 1.3%	449 1.1%	462 1.1%	477 1.1%	480 1.1%	440 1.0%	413 1.0%	406 1.0%	369 0.9%	384 0.9%	384 0.9%	364 0.9%	388 0.9%
P	216 0.5%	256 0.6%	275 0.7%	257 0.6%	242 0.6%	208 0.5%	221 0.5%	215 0.5%	218 0.5%	205 0.5%	194 0.4%	186 0.4%	200 0.5%	170 0.4%



*Table 4: NSW HSC maths and science subject combination data 2001-2014 for males who chose an Advanced mathematics course for their HSC and exactly one of the subjects biology, chemistry or physics.*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Year8(00)	427	431	428	431	428	435	445	450	445	449	446	446	440	440
Any one science	1965 4.6%	2147 5.0%	2089 4.9%	2108 4.9%	1949 4.6%	1770 4.1%	1686 3.8%	1691 3.8%	1682 3.8%	1823 4.1%	1649 3.7%	1738 3.9%	1775 4.0%	1794 4.1%
B	128 0.3%	137 0.3%	120 0.3%	151 0.4%	151 0.4%	146 0.3%	123 0.3%	134 0.3%	122 0.3%	143 0.3%	144 0.3%	158 0.4%	168 0.4%	166 0.4%
C	343 0.8%	375 0.9%	396 0.9%	405 0.9%	478 1.1%	458 1.1%	437 1.0%	442 1.0%	414 0.9%	414 0.9%	407 0.9%	424 1.0%	414 0.9%	404 .9%
P	1483 3.5%	1627 3.8%	1565 3.7%	1543 3.6%	1317 3.1%	1161 2.7%	1119 2.5%	1109 2.5%	1136 2.6%	1257 2.8%	1094 2.5%	1152 2.6%	1188 2.7%	1220 2.8%

*Table 5: NSW HSC maths and science subject combination data 2001-2014 for females who chose an Advanced mathematics course for their HSC and exactly one of the subjects biology, chemistry or physics.*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Year8(00)	410	414	411	414	416	419	429	433	424	431	432	430	427	426
Any one science	1221 3.0%	1307 3.2%	1408 3.4%	1395 3.4%	1419 3.4%	1303 3.4%	1238 2.9%	1213 2.8%	1273 3.0%	1324 3.1%	1227 2.8%	1263 2.9%	1249 2.9%	1213 2.8%
B	296 0.7%	306 0.7%	316 0.8%	314 0.8%	281 0.7%	314 0.7%	320 0.7%	305 0.7%	306 0.7%	308 0.7%	304 0.7%	311 0.7%	318 0.7%	308 0.7%
C	534 1.3%	576 1.4%	586 1.4%	609 1.5%	706 1.7%	643 1.5%	594 1.4%	604 1.4%	585 1.4%	643 1.5%	611 1.4%	658 1.5%	666 1.6%	613 1.4%
P	392 1.0%	412 1.0%	492 1.2%	463 1.1%	423 1.0%	342 0.8%	321 0.7%	296 0.7%	373 0.9%	367 0.9%	306 0.7%	290 0.7%	256 0.6%	288 0.7%

*Table 6: NSW HSC maths and science subject combination data 2001-2014 for males who chose an Advanced mathematics course for their HSC and at least two science subjects.*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Yr 8 (00)	427	431	428	431	428	435	445	450	445	449	446	446	440	440
2 or more	2386 5.6%	2294 5.3%	2358 5.5%	2629 6.1%	2460 5.7%	2516 5.8%	2453 5.5%	2462 5.5%	2382 5.4%	2632 5.9%	2776 6.2%	2777 6.2%	2723 6.2%	2884 6.6%
C+P	2009 4.7%	1899 4.4%	1957 4.6%	2099 4.9%	1924 4.5%	1877 4.3%	1802 4.0%	1738 3.9%	1683 3.8%	1899 4.2%	1969 4.4%	2022 4.5%	1908 4.3%	2063 4.7%
B+C+P	105 0.2%	145 0.3%	150 0.3%	219 0.5%	215 0.5%	251 0.6%	262 0.6%	321 0.7%	279 0.6%	282 0.6%	333 0.7%	307 0.7%	289 0.7%	316 0.7%
B+(C or P)*	272 0.6%	250 0.6%	251 0.6%	311 0.7%	321 0.7%	388 0.9%	389 0.9%	403 0.9%	420 0.9%	451 1.0%	474 1.1%	419 0.9%	493 1.1%	463 1.1%

Note \* One in three males chooses the Physics option here

*Table 7: NSW HSC maths and science subject combination data 2001-2011 for females who chose an Advanced mathematics course for their HSC and at least two science subjects.*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Year8(00)	410	414	411	414	416	419	429	433	424	431	432	430	427	426
2 or more	1535 3.7%	1511 3.6%	1483 3.6%	1688 4.1%	1597 3.8%	1615 3.9%	1476 3.4%	1464 3.4%	1476 3.5%	1488 3.5%	1523 3.5%	1527 3.6%	1597 3.7%	1535 3.6%
C + P	951 2.3%	890 2.1%	841 2.0%	970 2.3%	869 2.1%	778 1.9%	706 1.6%	641 1.5%	698 1.6%	645 1.5%	656 1.5%	665 1.5%	634 1.5%	628 1.5%
B+C+P	129 0.3%	121 0.3%	155 0.4%	170 0.4%	177 0.4%	189 0.5%	202 0.5%	181 0.4%	182 0.4%	168 0.4%	196 0.5%	190 0.4%	207 0.5%	168 0.4%
B+(C or P)*	455 1.1%	500 1.2%	487 1.2%	548 1.3%	551 1.3%	648 1.5%	568 1.3%	642 1.5%	596 1.4%	675 1.5%	671 1.6%	650 1.5%	729 1.7%	722 1.7%

Note \* One in ten females chooses the Physics option here

*Table 8: NSW HSC maths and science subject combination data 2001-2011 for males who chose an Intermediate mathematics course for their HSC and at least two science subjects.*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Year8(00)	427	431	428	431	428	435	445	450	445	449	446	446	440	440
2 or more	1396 3.3%	1341 3.1%	1446 3.4%	1595 3.7%	1553 3.6%	1602 3.7%	1684 3.8%	1701 3.8%	1649 3.7%	1606 3.6%	1817 4.1%	1791 4.0%	1716 3.9%	1683 3.8%
C+P	779 1.8%	714 1.7%	786 1.8%	828 1.9%	780 1.8%	742 1.7%	773 1.7%	738 1.6%	724 1.6%	675 1.5%	760 1.7%	751 1.7%	700 1.6%	709 1.6%
B+C+P	80 0.2%	88 0.2%	111 0.3%	152 0.4%	143 0.3%	186 0.4%	244 0.5%	235 0.5%	214 0.5%	225 0.5%	260 0.6%	262 0.6%	238 0.4%	251 0.6%
B+(C or P)*	537 1.3%	539 1.3%	549 1.3%	615 1.4%	630 1.5%	674 1.5%	667 1.5%	728 1.6%	711 1.6%	706 1.6%	797 1.8%	698 1.6%	692 1.6%	636 1.4%

Note\* One in three males chooses the Physics option here

*Table 9: NSW HSC maths and science subject combination data 2001-2011 for females who chose an Intermediate mathematics course for their HSC and at least two science subjects.*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Year8(00)	410	414	411	414	416	419	429	433	424	431	432	430	427	426
2 or more	1388 3.4%	1305 3.2%	1401 3.4%	1409 3.4%	1318 3.2%	1365 3.3%	1379 3.2%	1336 3.1%	1371 3.2%	1332 3.1%	1463 3.4%	1442 3.4%	1390 3.3%	1450 3.4%
C + P	337 0.8%	333 0.8%	294 0.7%	324 0.8%	294 0.7%	258 0.6%	231 0.5%	259 0.6%	205 0.5%	179 0.4%	214 0.5%	199 0.5%	195 0.5%	210 0.4%
B+C+P	108 0.3%	86 0.2%	113 0.3%	139 0.3%	131 0.3%	133 0.3%	150 0.3%	160 0.4%	178 0.4%	166 0.4%	146 0.3%	166 0.4%	175 0.4%	161 0.4%
B+(C or P)*	943 2.3%	986 2.4%	994 2.4%	946 2.3%	893 2.1%	974 2.3%	998 2.3%	917 2.1%	988 2.3%	987 2.3%	1103 2.6%	998 2.3%	953 2.2%	1005 2.4%

Note \* One in ten females chooses the Physics option here

## ANALYSIS OF THE DATA

### Trends in Mathematics and Science subject combinations

There is reasonable stability in the size of the Year 8 cohorts examined above although the HSC candidature has increased. This reflects increasing participation in upper secondary education over the fourteen year period. Since 2001 the proportion of Year 8 students going on to HSC has risen from 68.7% to 75.4% in 2014. This 6.7% increase in HSC participation rates might leave us to expect that there would be, if anything, an increase in the proportion of Year 8 students going on to study suitable math/science combinations.

In fact what is shown is that there have been small incremental, downward trend changes in almost every table. While these changes are indeed very small, examination of the total proportions in these maths and science combinations in both 2001 and 2014 suggests a substantial decline overall. This decline is evident only among girls. Boys' total participation in at least one maths and one science subject in 2001 was 19.7% and in 2014 19.0%; with no shift evident. Girls' total participation in 2001 was 16.8% and by 2014 this dropped to 14.1%. We have shown previously that this reduction of the number and proportion of students taking mathematics and science combinations is, for the most part, due to a decline in mathematics participation (Wilson & Mack, 2013). This decline in the proportion of female students going on to take maths and science for HSC occurred while the proportion of female students in Year 8 going on to complete the HSC increased by 5.6% (from 74.4% in 2001 to 80.0% in 2014).

The tables document a decrease in female participation in maths/science and an increasing gender disparity. Analysis of males appears less problematic – or does it? While the overall participation in HSC increased by 6.7% during this period, among males there was a greater increase. The proportion of males undertaking the HSC in 2001 was 63.2%, which rose to 70.9% in 2014 – a 7.7% increase. With more male students are going on to HSC study we might expect more to go on to maths/science study. This is not the case. Thus it can be argued that the male participation figures are also disappointing. It appears that, among both female and male increases in upper secondary education, growth in participation did not extend to maths and science study.

### Proportions of students with no mathematics and no science for HSC

The data presented so far do not consider whether or not the proportions of HSC students presenting no mathematics, no science, or indeed neither mathematics nor science have altered significantly over the period 2001-2014. Since the annual HSC Scaling reports published by the NSW Universities Admission Centre on behalf of the NSWV-CC also do not report these proportions, they are presented below for the ATAR-eligible cohort, which is of most interest to the university sector.

Table 10 shows the proportions of ATAR-eligible students taking no math or science courses for HSC. There has been relative stability in the percentages reported over the period 2009-2014 and so the relevant data is given for the years 2001, 2009 and 2014 only. Additional detail on these trends is evident in graphs showing the annual proportions not participating in mathematics or science study (See Figures 1 and 2).



*Table 10: Proportion of ATAR eligible students studying HSC without maths, without science and with neither maths nor science in 2001, 2009, 2014.*

	2001		2009		2014	
	M	F	M	F	M	F
No maths	3.1	7.5	9.9	21.5	9.3	21.4
No science	42.6	50.5	41.7	50.6	38.4	49.3
No maths or science	2.1	5.4	6.4	14.5	5.9	14.6

Note the particularly large increases, between 2001 and 2009, in the percentages of both males and females presenting with no mathematics courses at all; and the huge percentages of both males and females who have presented no science courses at all since the introduction of the new HSC in 2001. It should be noted that, prior to the introduction of the new HSC in 2001, for at least a decade before, over 98% of HSC students presented at least one maths subject for their HSC.

While the proportion of students studying no science course before 2001 is not available; it is clear that ATAR eligible students' science participation was substantially higher in 1991 (Biology 35%, Chemistry 26%, Physics 24%) than in 2014 (Biology 30%, Chemistry 20%, Physics 17%). Participation in sciences was much higher in 1991 and declined steeply until 2002/2003. In biology, for example 35% of ATAR eligible students participated in 1991, this fell to a low of 23% in 2002/2003 and then recovered slowly to around 30% in 2014. In physics and chemistry the post-1991 decline was similar; however since 2006 participation has been static in these subjects at around 17% and 19% respectively.

The recent increases in the percentages for those presenting with neither mathematics nor science is essentially a consequence of the increases in those with no mathematics. Although it is clear that since 2001 a substantial proportion of ATAR eligible students do not take any science courses, these figures are relatively stable over the period and even show some indications of declines.

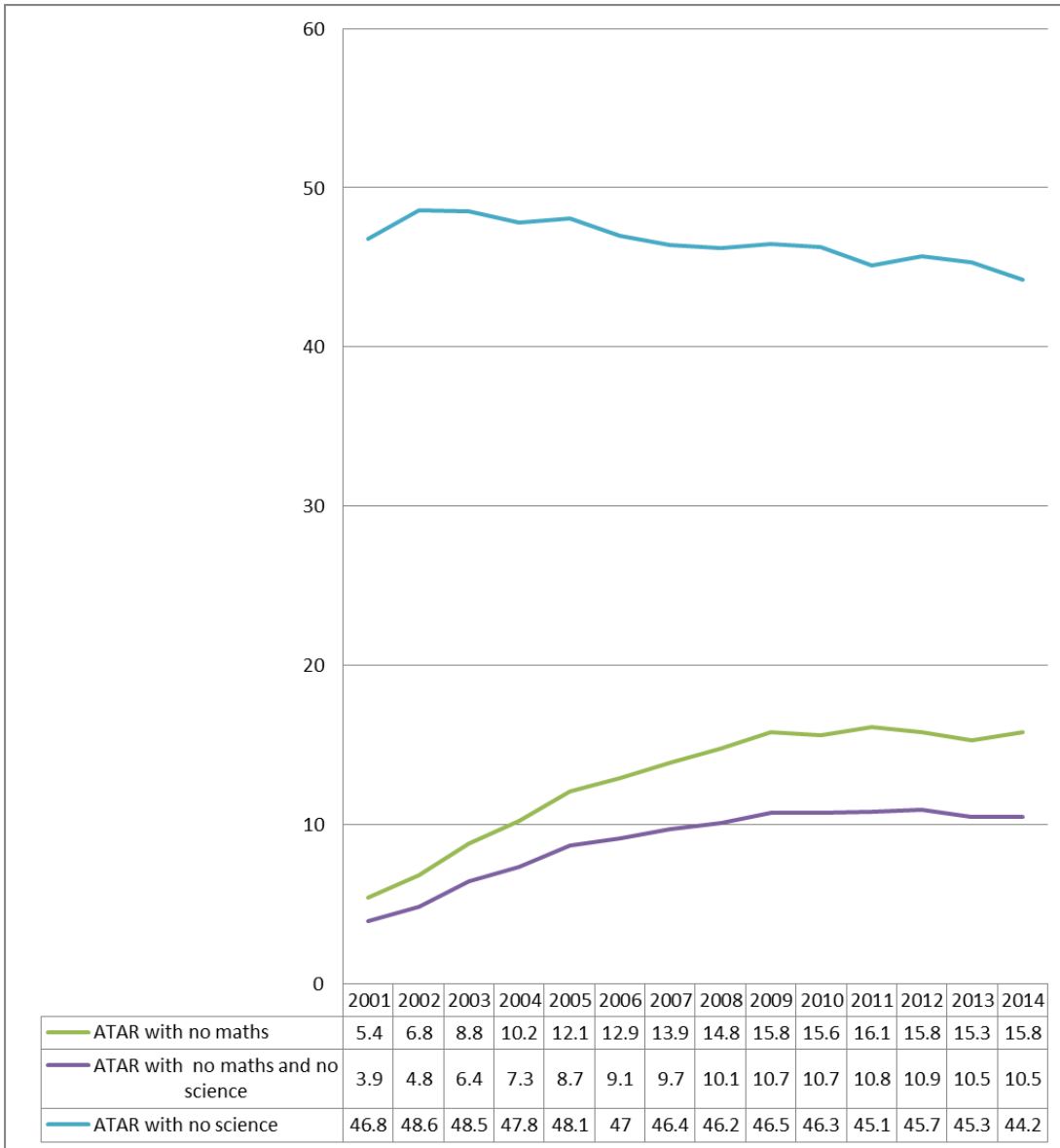
From the 2001 to 2014 data we can observe steep downward trends in maths participation. Among the ATAR-eligible NSW HSC cohort 5.4% chose to study no mathematics for their HSC in 2001. By 2009, this figure had risen steadily to just over 16%, two-thirds of whom were females. In fact, 21.5% (6,316) of the ATAR-eligible females completing their 2009 NSW HSC did not include any mathematics course in their HSC subjects; against a figure of 7.5% (1,982) in 2001 (the respective data for boys is 9.8% (2,505) in 2009 as against 3.1% (719) in 2001).

Among the broader HSC cohort, 9.5% presented no mathematics course for their HSC in 2001; one-third of these were male and two-thirds female. In 2011, this figure was 21.8%, with the same ratio of male to female students

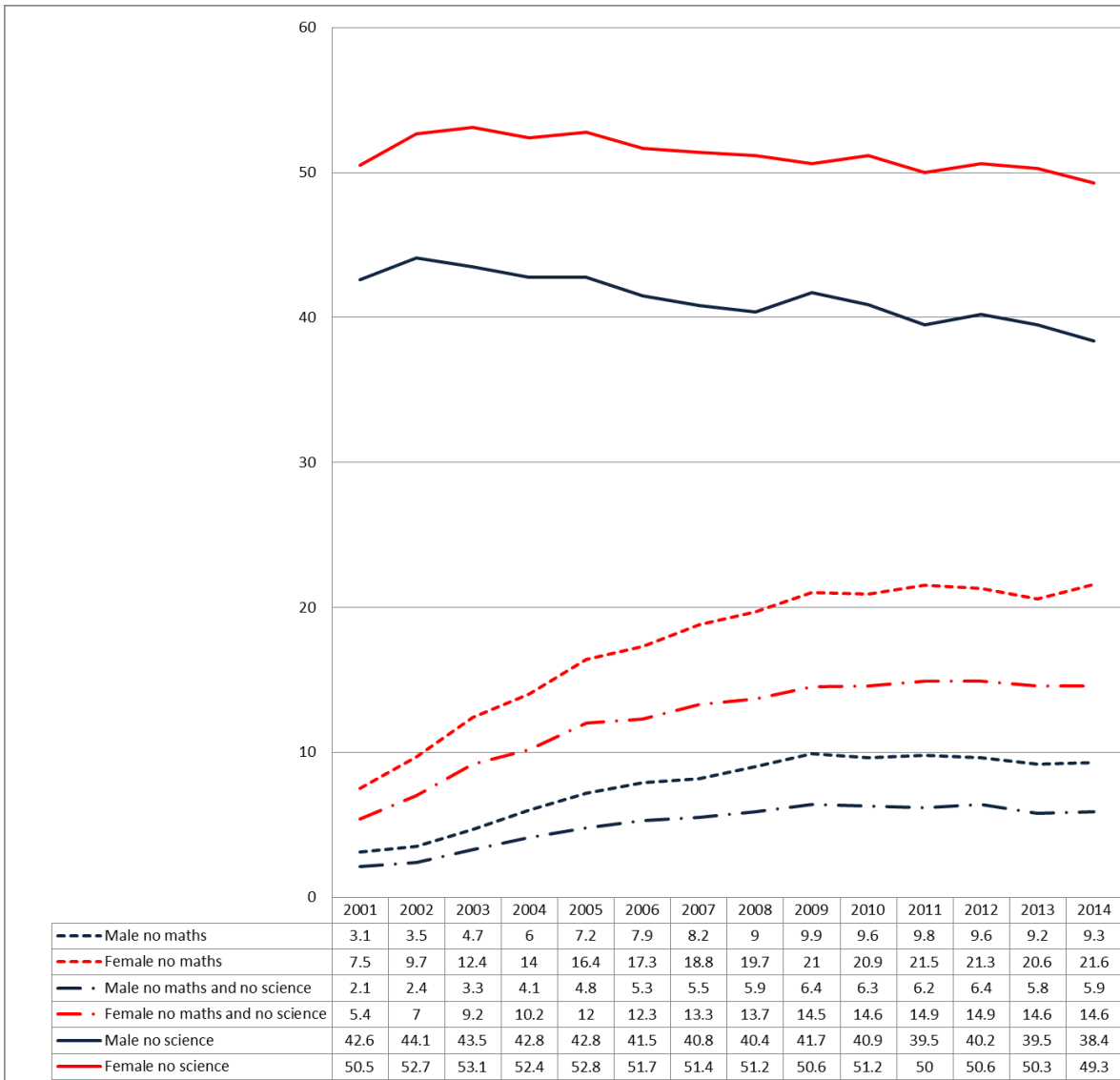
and by 2014 this had risen further to 23.4% (29% of females and 18% of males).

When this data is combined with the fact that some 50% of both males and females have been electing to take the Elementary non-calculus-based (General) mathematics course for the HSC throughout this period, then it is clear that some 50% of the entire HSC cohort is now ill-prepared to understand any argument presented to them that depends on an understanding of rates of change in scientific data.

Parallel to the shift toward Elementary (General) mathematics since 2001, there has been a decline in the numbers of ATAR-eligible students electing to study Intermediate (2unit) Mathematics, from about 30% to 20%, a smaller decline for Advanced Extension 1 (12% to 10%) and a small increase in Extension 2 (5.2% to 6.3%).



*Figure 1: Proportions of ATAR eligible cohorts with no maths, no science and both no maths and no science 2001-2014*



*Figure 2: Gender proportions of ATAR eligible cohorts with no maths, no science and both no maths and no science 2001- 2014*

## Conclusion

This report finds the **disturbing trends outlined in the previous report are still evident** in data since 2011, in that there are low levels of maths and science participation among HSC and ATAR groups, especially among girls. While **science participation is low**, with less than half the HSC cohort taking a science subject, it has been **fairly stable** since the introduction of the new HSC in 2001. Indeed some slow growth in the proportions for biology is discernible. Declines in mathematics and science combinations of study are due to declines in mathematics enrolments at the Intermediate (2 unit) and Advanced (Extension) levels.

In 2013, The Mathematical Association of NSW (MANSW) carried out an online survey of NSW secondary mathematics teachers<sup>3</sup>. A particular finding, of relevance to this report, is quoted below:

“ Although the number of students completing Extension 1 and 2 has changed little, the MANSW survey results indicate that teachers are concerned that the number of students completing Mathematics (2 Unit) without Extension has fallen by 18% since 2001. The teachers surveyed believe that many capable students are now choosing to undertake the General Mathematics course rather than Mathematics (2 Unit) to maximise their ATAR contribution, in part by allowing them more time to work on all their other courses. Other comments related to what the teachers perceived as excessively difficult 2 Unit HSC examinations and the demanding workload, which has a negative impact on student performance in other subjects.”

The non-calculus based General Mathematics course for the HSC has, for many years, been the most popular mathematics course option for HSC

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<sup>3</sup> This may be found online at <http://www.mansw.nsw.edu.au/resources/public-resources/2013-secondary-mathematics-teacher-survey-report>

students. The concern expressed above is particularly focused on the scaled mark distributions, at the upper end, observed for General and 2-unit only Mathematics students in recent HSC examinations, which, it is suggested, may favour able General students on the grounds that able 2 unit-only students are relatively disadvantaged because of the very able Extension 1 students' performance on the common 2-unit paper. The authors understand that this issue is currently being considered by the NSWVC-C's Technical Committee on Scaling. The data presented in this report suggests that it will be important to address this issue if we are to reverse the negative trends in math and science combinations studied for HSC which are so important as preparation for many university degrees .

Perhaps of greatest concern is the **rise in the proportions of students undertaking no mathematics study**. This rose sharply, trebling between 2001 and 2009. Since 2009 these proportions have been stable at approximately 20%. Our findings suggest that the many programs designed to lift student interest and engagement in mathematics in recent years are yet to show an impact on HSC study patterns. Indeed it is evident that other factors continue to operate that have resulted in substantial proportions of students undertaking no mathematics study and a growth in those who choose elementary rather than intermediate level mathematics.

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