HM Government

Strength and Opportunity 2017 supplemental report:

Trends in the UK life sciences, 2009 – 2017

October 2018

This is a supplementary report to the ninth annual report analysing the information contained in the Health Life Sciences Database, published in October 2018.

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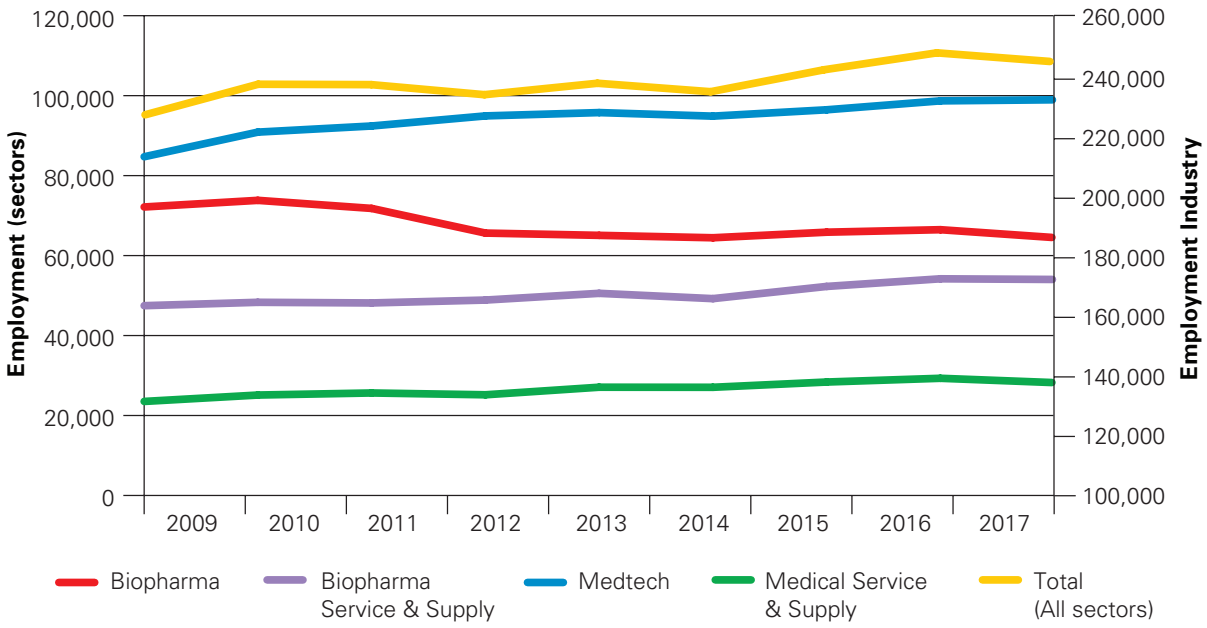
Key messages – Life sciences in the UK from 2009 to 2017

- The life sciences industry in the UK has grown between 2009 and 2017, with the number of businesses increasing by 7%, from 5,150 to 5,880, and employment increasing by 17,900 (8% increase over nine years). Life sciences employment as a proportion of total UK employment has remained broadly stable at 0.8%[1].
- The industry generated £70.8bn in turnover in 2017, an increase of 1.7% from turnover of £69.6bn in 2009 (adjusted to 2017 prices).
- Between 2010-2014, total employment in the life science sector remained fairly constant with a decrease in the biopharma sector offsetting a small increase in Medtech. Growth resumed between 2014 and 2016, followed by a small decrease of 1.2% from 2016 to 2017.
- Excluding core Biopharma, employment in the life science industry increased by 25,500 between 2009 and 2017, an increase of 16% compared to a 10% increase for all UK employment[2].
- Turnover peaked in 2011 before falling to a low of around £66.6bn in 2014, before resuming growth.

1 Based on comparing with H100 Regional labour market, release 14th August 2018 – https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/headlinelabourforcesurveyindicatorsforallregionshi00/current

2 H100 Regional labour market, release 14th August 2018 – https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/headlinelabourforcesurveyindicatorsforallregionshi00/current

Figure 1: *Life Science Employment by sector and for industry 2009 to 2017 (industry total – RHS, sector total – LHS)*



Sectors – biopharmaceuticals, medical technology, service & supply

- Comparing the landscape of the industry in 2017 to 2009, the major change is the increasing economic contribution of the Medtech sectors (core plus service & supply) to the industry. This shift is particularly seen for employment, where companies involved in medical technology now employ more than those involved in biopharmaceuticals (51.8% v 48.2% of industry employment).
- Except for core Biopharma, all sectors increased employment between 2009 and 2017. The core Medtech had the largest absolute increase of all the sectors at 14,200 or 17% increase since 2009 although turnover fell by 2.5% over the same period. While turnover in core Biopharma has decreased, it is still the largest contributor to the industry at 47% of the total.
- Both service & supply sectors increased turnover (at constant prices) between 2009 and 2017 by 22.4% and 53.6% for the Biopharma and Medtech serving sectors respectively. These sectors also had strong employment growth adding a total of 11,290 employees over the period.

Segmentation

- The decrease in employment in the small molecules sector (9,400 decrease) is the main factor driving the flat growth for the whole industry between 2010-2014. Several of the Top 25 companies, who are the majority employers in the segment, completed site closures and re-organisations during this period.

- The Top 3 segments by employment and turnover in the industry have stayed constant over the 9-year period, in order: small molecules; suppliers of contract manufacturing and research services to pharmaceutical companies; and suppliers of reagents and equipment to these companies. These three segments accounted for 37% and 32% of the employment in 2009 and 2017, respectively.
- The digital health segment grew employment by 2,190 between 2009 and 2017 to become the largest segment in core Medtech from the second largest, overtaking in vitro diagnostics.

Business Demographics

- The regions of London, the South East and East of England had a net increase in employment of 9,750 while the rest of England, Northern Ireland, Scotland and Wales had a net increase of 8,160. This data suggests that there has been limited concentration of life science economic activity towards the south of the UK and the majority of regions have experienced increases in life science industry employment. Only the West Midlands and the South East of England saw large reductions in employment.
- Regional decreases in employment were heavily concentrated in the core Biopharma sector, representing 78.5% of all decreases in employment. Decreases in this sector indicates a concentration to the East of England and London from the rest of the UK for core Biopharma.
- Across the regions, different sectors have driven the changes in employment seen across the period. Examples include: London and the North east which were the only regions to see increases in employment for all sectors; Yorkshire and the Humber, where 90% of the increase was due to the core Medtech sector; the South West where only Biopharma service & supply showed an increase.
- The majority of the employment increase in the industry was on sites where the primary activity is sales & service (including HQ activity). Employment on these latter sites increased by 10,990 or 12.3%, compared to 3,160 (3.9%) or 2,160 (2.0%) for R&D and manufacturing respectively. Employment in research and development (R&D) and manufacturing increased in all sectors except in core Biopharma.

Purpose of this report

0.1 This report is a supplemental to *Strength and Opportunity 2017,* published in May 2018. It contains analysis of long-term trends utilising a new methodology and replaces the trend analysis published in previous reports. The details of the new methodology used for this supplement is detailed in Chapter 2.

0.2 In previous annual reports trends were reported using two approaches, one that looked at trends over several years from a sub-set of companies and the other examined changes between the current and previous report years. The latter approach reconciled changes to the records in each annual dataset due to adjustments such as revising whether companies were in scope to give an estimate of annual change due to "real growth" in employment and turnover.

0.3 The second method from previous reports used a subset of companies in the database which had a continuous set of data back to 2009. The data sources in this subset consisted of large companies and did not take account of changes due to companies that were below the threshold to require publication of their full accounts. This approach skewed the trend analysis and did not take account of the economic trends associated with small and medium-sized enterprises (SMEs).

0.4 By backfilling records in the database, a comprehensive and continuous set of economic data on companies in the UK life science industry from 2009 to 2017 has been created.

0.5 The data, charts, and figures included in this document are published at https://www.gov.uk/government/collections/bioscience-and-health-technology-database-annual-reports

Chapter 1

Trend analysis

In this chapter, we report on the major trends in employment and turnover in the life industry as a whole, by segment, and by geography over 2009 to 2017.

1.1 Industry overview

- The life science industry has increased employment over the period 2009 to 2017 from 227,900 to 245,800; an 8% increase over the nine-year period – see Figure 1: All sectors except for core Biopharma – grew employment. Excluding core Biopharma, employment in the life science industry increased by 25,500, an increase of 16% compared to a 10% increase for all UK employment[3].
- Between 2010-2014, total employment in the life science sector remained fairly constant with a decrease in the biopharma sector offsetting a small increase in Medtech across the period. Growth resumed between 2014 and 2016, followed by a small decrease of 1.2% from 2016 to 2017.
- Turnover showed a modest increase of 1.7% over the same period (adjusted to 2017 prices). The nine-year period is characterised by a rise in turnover from 2009 (£69.6bn) to a peak in 2011 (£75.3bn). This was followed by a 12% fall to around 66.6bn in 2014, before returning to growth. See Figure 2.
- Underlying this overall turnover trend is a strong performance by the service & supply sectors that in total grew turnover by 29%, with an acceleration in growth rate from 2014. This is compared to a 5.8% decline in the turnover of the core Biopharma and Medtech sectors.
- The total number of businesses in the industry increased 7%, from 5,150 to 5,880 since 2009.

3 H100 Regional labour market, release 14th August 2018 – https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/headlinelabourforcesurveyindicatorsforallregionshi00/current

Figure 2. *Life Science Turnover by sector and for industry 2009 to 2017*

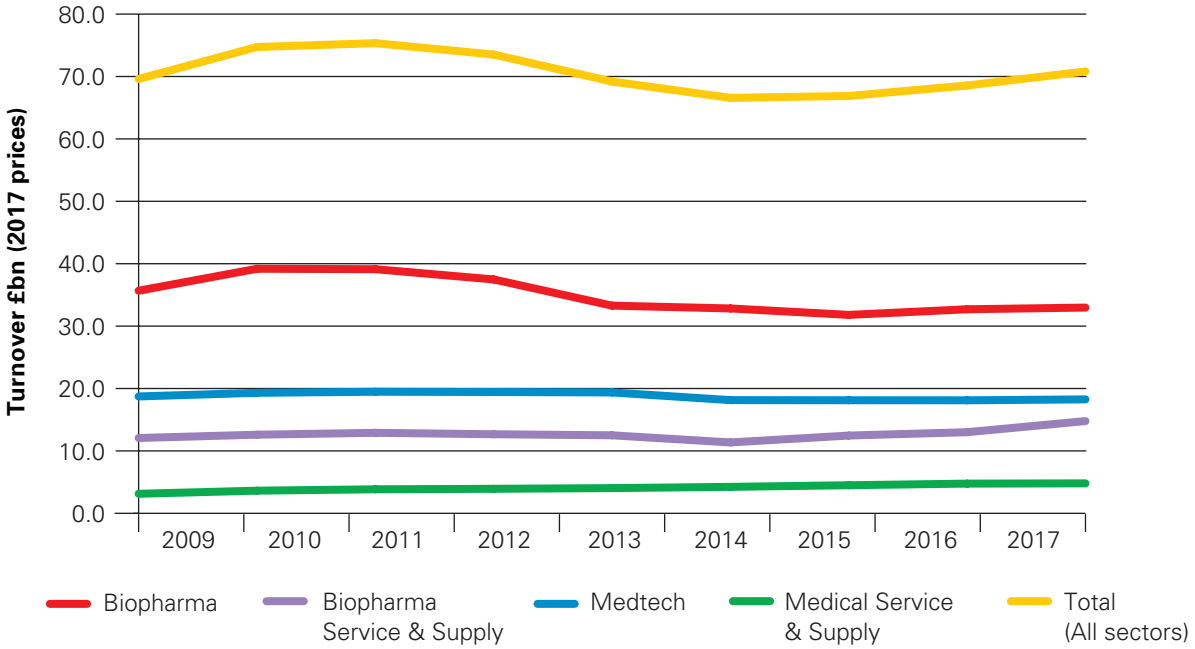
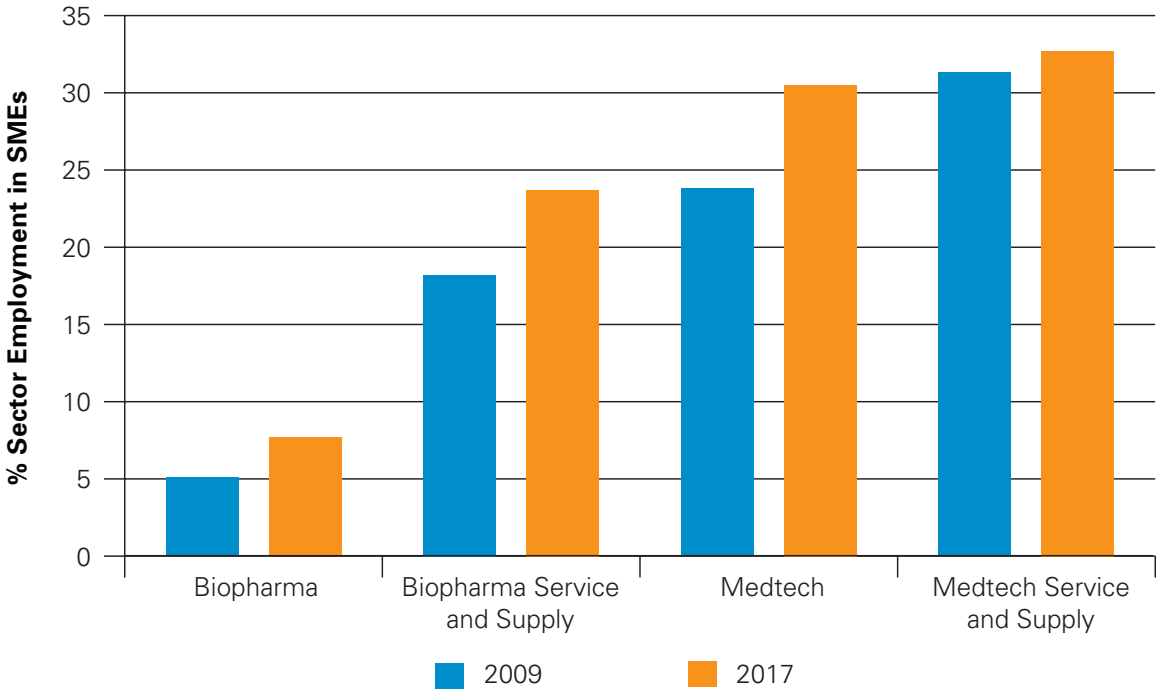


Table 1. *Employment, turnover and sites for the Life Science industry 2009 to 2017*

	2009	2010	2011	2012	2013	2014	2015	2016	2017
Employment	227,855	238,120	237,987	234,612	238,450	235,612	242,963	248,665	245,770
Turnover £bn (2017 prices)	69.60	74.73	75.34	73.52	69.19	66.58	66.88	68.56	70.81
Sites	5,899	6,083	6,210	6,321	6,460	6,327	6,417	6,336	6,214

- Between 2009 and 2017, the percentage contribution of SMEs to the total employment in the industry has increased from 17.5% to 23.3%, with particularly strong growth in the contribution of SMEs to employment in the core Medtech sector.

Figure 3. *Employment in SMEs as a percentage of the total life science industry employment – 2009 compared to 2017*



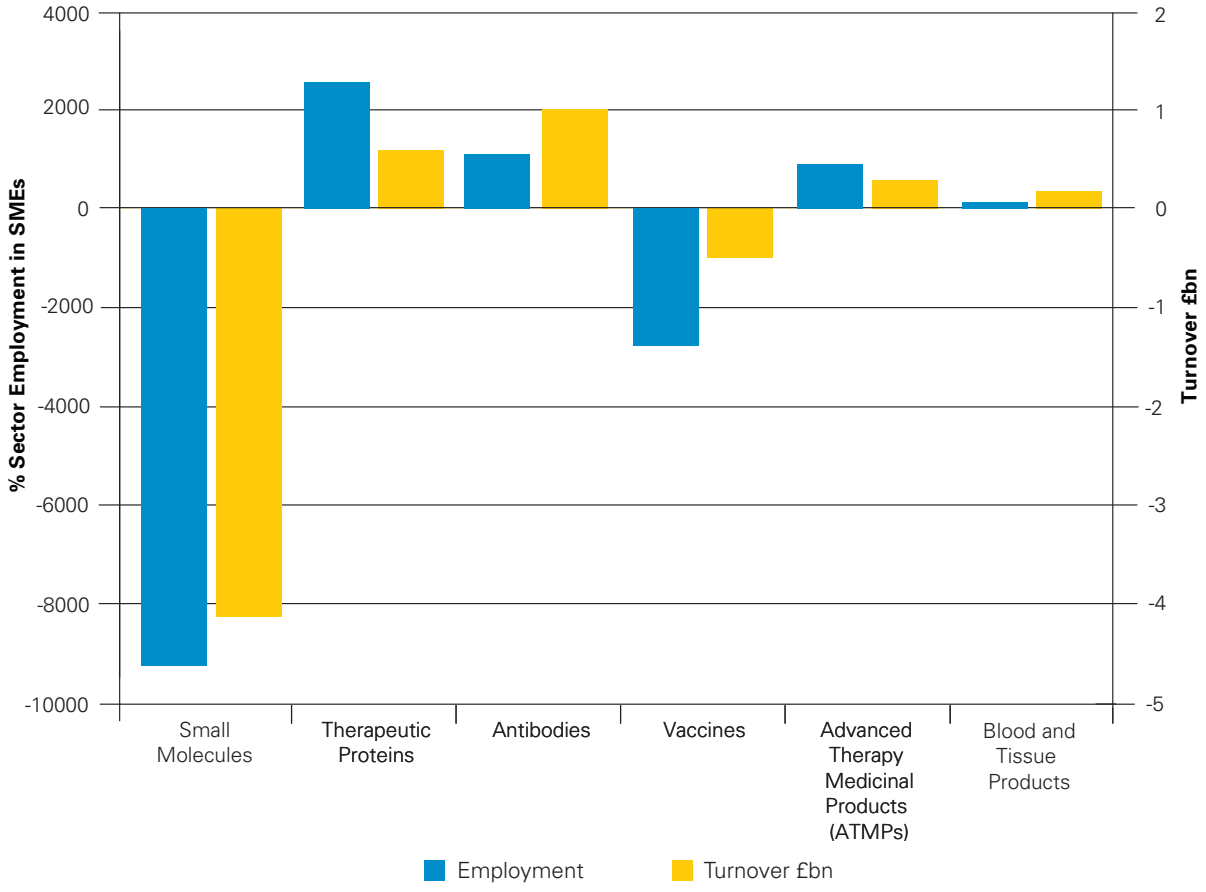
1.2 Biopharmaceuticals (Core Biopharma)

- The core Biopharma sector showed a decrease in both employment and turnover between 2009 and 2017 of 11% (7,600) and 7.6% (£2.7bn) respectively. The fall in employment was particularly pronounced between 2010 and 2012, followed by a relatively stable period in the subsequent years. Turnover fell between 2011 and 2013 but has since shown a fairly constant trend; a pattern that is similar to that of the whole of the Life Science industry.
- The small molecule and vaccines segments were the largest contributors to the falls in both turnover and employment for this sector. Between 2009 to 2017 employment in these segments has fallen by a total of 12,100 and turnover by £4.6bn. This is compared to increases of 4,500 and £1.9bn respectively for all other core biopharma segments with particularly strong growth in the antibody and therapeutic proteins segments.

Table 2. *Employment, turnover and number of sites for core Biopharma sectors 2009 to 2017*

	2009	2010	2011	2012	2013	2014	2015	2016	2017
Employment	72,154	73,812	71,795	65,627	65,057	64,455	65,849	66,472	64,539
Turnover £bn (2017 prices)	35.67	39.19	39.12	37.48	33.28	32.83	31.80	32.70	32.97
Sites	733	748	759	781	799	780	801	810	818

Figure 4. *Change in employment and turnover for the core Biopharma sectors 2009 to 2017*



- Between 2009 and 2017, the Top 25 global biopharma companies saw a fall of 8,100 in employment; 67% of the total fall in employment for the sector[4]. These major companies now account for 60% and 65% of the sector employment and turnover respectively compared to 65% and 76% in 2009.

4 The names of the Top 25 global pharma have changed slightly over the 9-year period with 4 companies entering the list and 4 falling out of the list.

- The change in employment seen in the Top 25 global companies is the factor driving the fall in employment for the sector and the flat growth for the whole industry between 2010-2014. Several of the Top 25 companies completed site closures and re-organisations during this period.
- SMEs have increased their contribution to the sector employment by 2.5% between 2009 and 2017.
- Analysis of the business activity of sites in the sector indicates that decreases in employment at sites where the primary activity is manufacturing has declined by 18% compared to 12% at R&D sites.

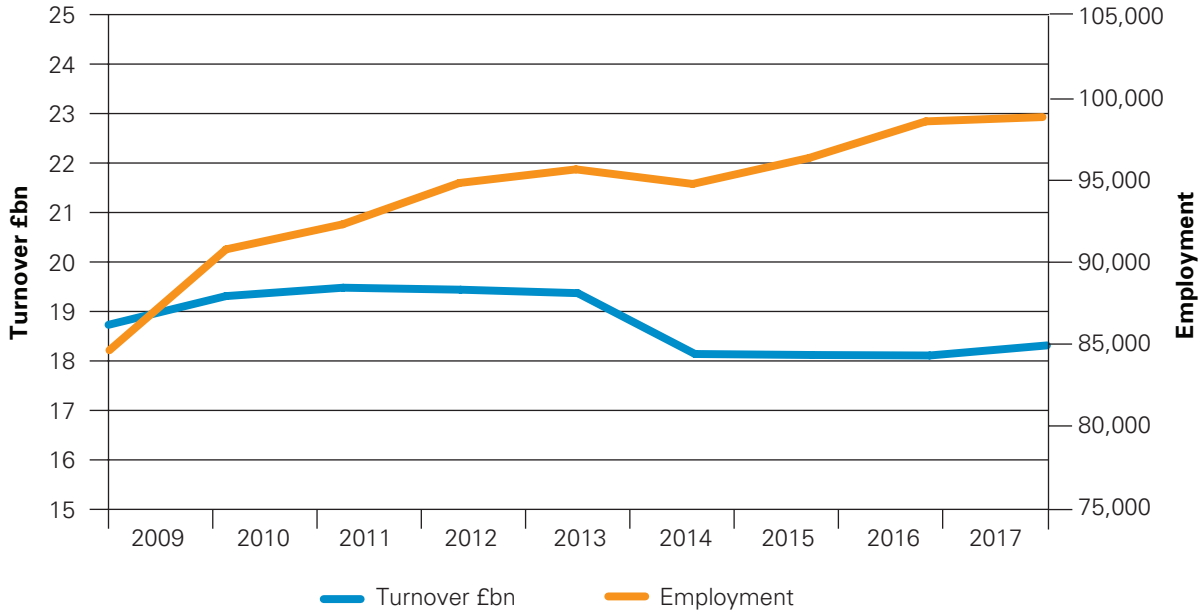
1.3 Medical technology (Core Medtech)

- The Medtech sector increased employment between 2009 and 2017 from 84,700 to 98,960, adding a net 14,260 (17%) to the sector employment. Over the same period turnover decreased by 2.5% (£460m) from £18.7bn in 2009 to £18.3bn in 2017. Employment growth was consistent over the 9 years, averaging 2% per annum. Turnover increased slightly between 2009 and 2011 before falling between 2012 and 2014 and remaining constant until 2017, as shown in Figure 5.
- Of the 20 segments in the sector, turnover in 10 segments increased between 2009 and 2017 by a total of £1.6bn while the turnover in the remaining segments decreased by £2.0bn, contributing to the small fall seen in this sector across the period.
- Looking at the Top 5 segments by turnover, four segments have remained in this Top 5 group every year from 2009 to 2017: single use technology (the largest segment by turnover throughout the nine years); in vitro diagnostics; orthopaedic; and wound care. Of the Top 5 segments by turnover, the two with the largest increase over the nine years were in vitro diagnostics (8%, £122m) and digital health (7%, £75m).

Table 3. *Employment, turnover and sites for core Medtech 2009 to 2017*

	2009	2010	2011	2012	2013	2014	2015	2016	2017
Employment	84,717	90,878	92,408	94,932	95,763	94,873	96,463	98,695	98,956
Turnover £bn (2017 prices)	18.73	19.31	19.48	19.44	19.37	18.14	18.12	18.11	18.26
Sites	2,933	3,002	3,032	3,043	3,093	2,969	3,004	2,939	2,866

Figure 5. *Core Medtech employment and turnover 2009 to 2017 (Employment – RHS, Turnover – LHS)*



- Sixteen of the Medtech sectors saw an increase in employment between 2009 and 2017. Single use technology showed the largest increase of 3,900 or 70% over nine years, while surgical instruments showed the largest percentage increase of 2,000 people, a 95% increase in employment. In the Top 5 segments in 2017 by employment, three showed growth greater than 25% between 2009 and 2017: single use technology; assistive technology; and digital health.

1.4 Segments – Key Trends

- Comparing the Top 5 segments for employment, turnover, and number of sites between 2009 and 2017 shows the continuing importance of the small molecules segment throughout this period; as shown in Figure 6 below. The service & supply segments that support the Biopharma sector also maintain the second and third positions in terms of employment and turnover over the nine-year period.

Figure 6. *Comparison of the Top 5 segments by employment, turnover and number of sites 2009 and 2017*

2009

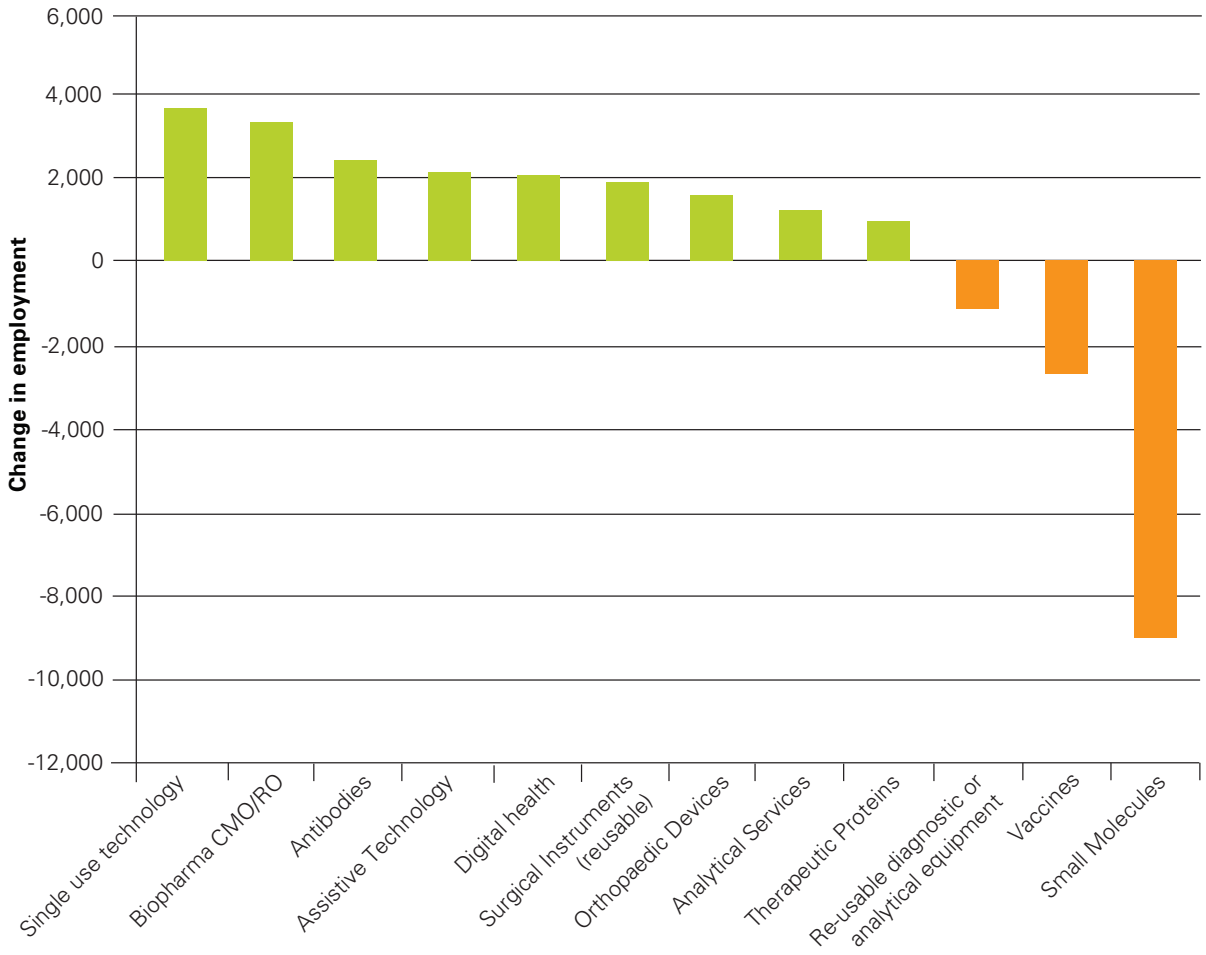
	Employment	Turnover	Sites
1st	Small Molecules	Small Molecules	Small Molecules
2nd	Biopharma Contract Manufacturing/Research Organisation	Biopharma Reagent, Equipment and consumables supplier	Assistive Technology
3rd	Biopharma Reagent, Equipment and consumables supplier	Biopharma Contract Manufacturing/Research Organisation	Digital Health
4th	In vitro diagnostic technology	Vaccines	Biopharma Reagent, Equipment and consumables supplier
5th	Digital Health	Single Use Technology	Medtech Reagent, Equipment and consumables supplier

2017

	Employment	Turnover	Sites
1st	Small Molecules	Small Molecules	Small Molecules
2nd	Biopharma Contract Manufacturing/Research Organisation	Biopharma Reagent, Equipment and consumables supplier	Digital Health
3rd	Biopharma Reagent, Equipment and consumables supplier	Biopharma Contract Manufacturing/Research Organisation	Specialist Consultants
4th	Digital Health	Single Use Technology	Assistive Technology
5th	Single Use Technology	Therapeutic Proteins	Biopharma Reagent, Equipment and consumables supplier

- Of all the segments in the industry (62), 45 experienced increases in employment between 2009 and 2017, while 17 decreased. Of those that increased, the largest absolute increase in employment (3,900) was seen in the Medtech single use technology segment. Nine segments, including six in Medtech and three in Biopharma, account for 59% of the increase in the industry. Of those segments that saw a decrease in employment, three account for 80% of the decrease with small molecules (biopharma) accounting for 56%. See Figure 7.

Figure 7. *Industry segments that account for the largest increases and decreases in employment for all life sciences*

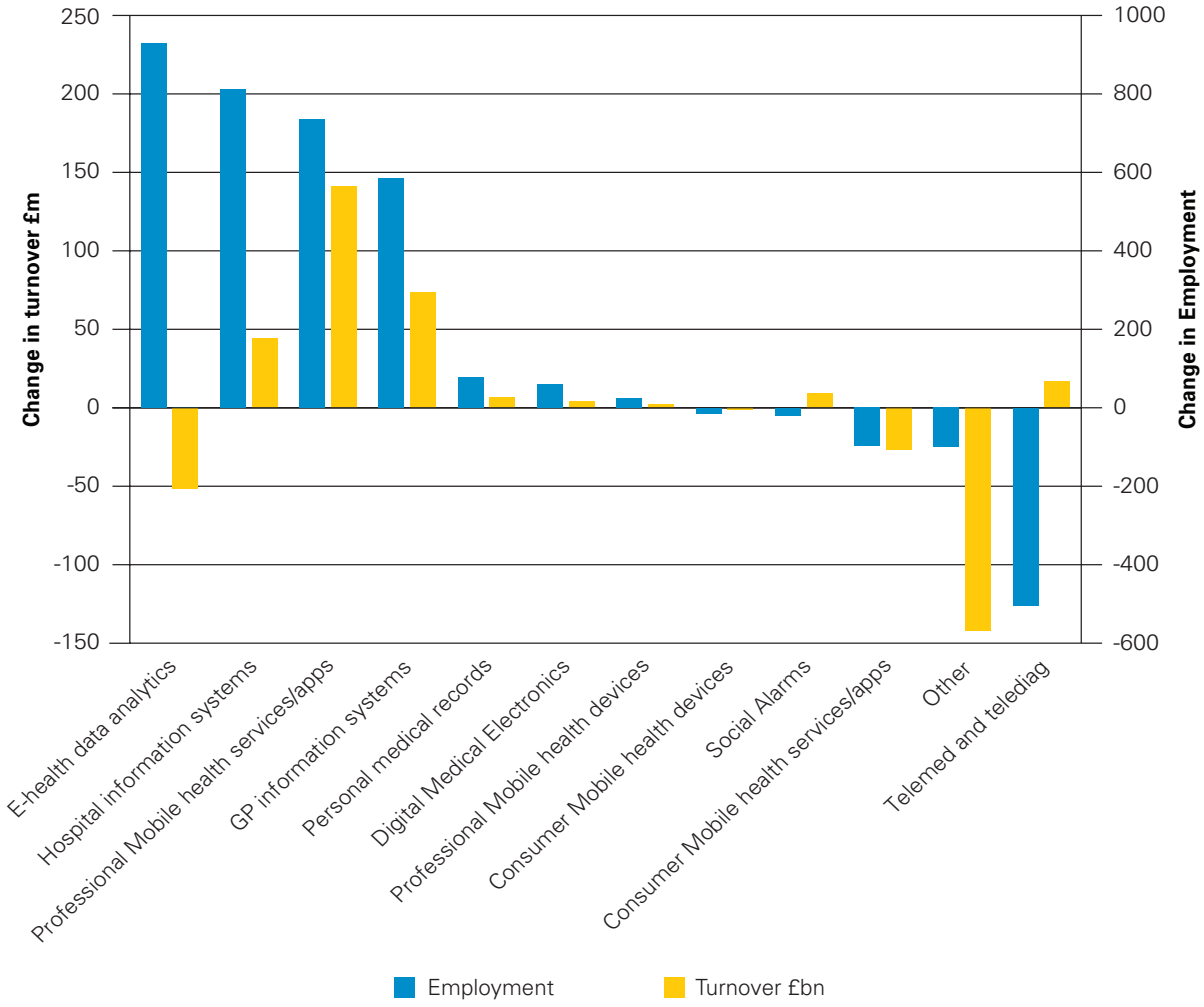


- The suppliers of reagents and equipment to the Biopharma core sector had the largest increase in turnover over the period, increasing by £2bn or 40%. The decrease in turnover in the small molecules segment of £4.1bn dominated the total fall in turnover for the industry accounting for 54% of the total of the 23 segments that experienced a fall.

1.5 Digital Health

- The digital health segment grew employment by 26% (2,190) and turnover by 7% (£75m) moving from fifth to fourth largest segment in the industry by employment and from thirteenth to fourteenth in turnover.
- In the digital health segment, hospital information systems (includes electronic health records) is the dominant sub-segment in both 2009 and 2017. In 2017, this sub-segment accounted for 40% and 37% of total digital health turnover and employment respectively. This sub-segment, along with GP information systems and E-health have all remained in the Top 5 sub-segments by employment over this nine-year period. The fastest growing sub-segment with more than 100 employees (over the whole period 2009 to 2017) was that providing professional mobile service and apps.

Figure 8. *Changes in Employment and Turnover for the Digital Health sub-segments 2009 to 2017*



Note: 'Other' includes activity that we have been unable to classify at a sub-segment level within Digital Health. Classification for recent activity is greatly improved due to an increase in the availability of data, leading to the large falls seen in this category.

- Over the nine-year period the E-health sub-segment had the largest absolute increase in employment. Together with hospital information systems, professional mobile health services and GP information systems these four sub-segments account for 94% (2,760) of the employment increase seen in digital health. These four segments also increased turnover, this included the sub-segment with the largest increase in turnover (£141m) over 2009 to 2017; professional mobile health services/ apps

Table 4 shows the details of the changes in employment and turnover for the digital health sub-segments.

Table 4. *Employment, turnover and sites in Digital Health 2009 to 2017*

	2009	2010	2011	2012	2013	2014	2015	2016	2017
Employment	8,315	8,691	9,169	9,442	9,641	9,504	9,316	9,573	10,504
Turnover £bn (2017 prices)	1.15	1.04	1.10	1.11	1.26	1.27	1.14	1.12	1.22
Sites	305	335	360	397	437	451	487	489	482

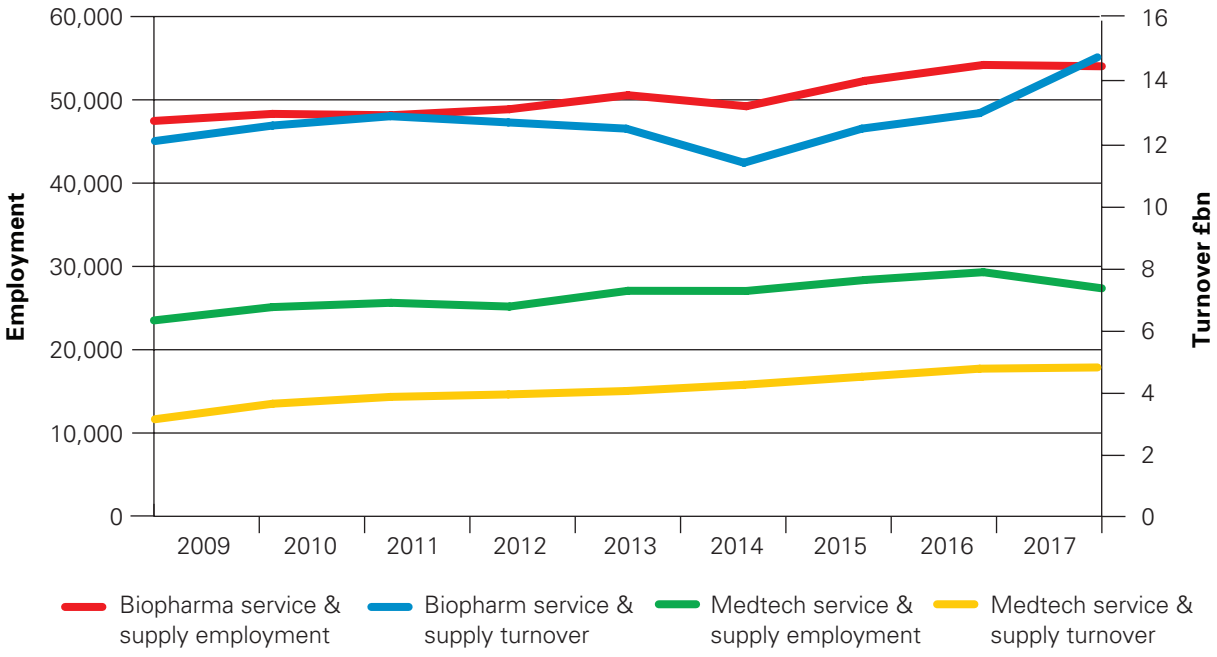
1.6 Service & supply sectors

- The Biopharma and Medtech service & supply sectors both increased employment and turnover between 2009 and 2017. The Biopharma service & supply increased employment by 6,600 or 14% since 2009 while turnover increased £2.7bn or 22%, this in contrast to the core Biopharma sector which saw falls in both employment and turnover. The Medtech service & supply sector grew employment and turnover by 4,700 (20%) and £1.7bn (54%) respectively.
- Growth in turnover and employment for the Medtech service & supply sector was consistent over the 9-year period. In the Biopharma service & supply, employment growth was also relatively consistent over the period while turnover showed a fall in 2013-2014 before returning to growth, increasing at a higher rate than between 2009-2013.
- The Top 3 segments by both employment and turnover in the Biopharma service & supply sector in 2009 and 2017 are: contract manufacturing & research; consumables and equipment suppliers; and clinical research organisation. Together these three segments accounted for 68% and 83% of turnover and employment respectively in 2017.
- The Biopharma contract manufacturing & research segment showed the strongest growth in employment over the nine years, adding 3,570 jobs while increasing turnover by 20%. The other two segments in the Top 3 showed slight falls of 2-4% in employment over the period.

Table 5. *Employment, turnover and sites in Supply and service sectors*

		2009	2010	2011	2012	2013	2014	2015	2016	2017
Employment	Biopharma Service & Supply	47,467	48,313	48,150	48,873	50,556	49,229	52,280	54,190	54,029
	Medtech Service & Supply	23,517	25,117	25,634	25,180	27,074	27,055	28,371	29,308	28,246
	Total	70,984	73,430	73,784	74,053	77,630	76,284	80,651	83,498	82,275
Turnover £bn (2017 prices)	Biopharma Service & Supply	12.07	12.60	12.90	12.67	12.50	11.36	12.46	13.00	14.78
	Medtech Service & Supply	3.13	3.63	3.85	3.93	4.04	4.24	4.50	4.76	4.80
	Total	15.20	16.23	16.75	16.60	16.54	15.60	16.96	17.76	19.58
Sites	Biopharma Service & Supply	1,238	1,302	1,370	1,427	1,483	1,483	1,513	1,509	1,488
	Medtech Service & Supply	995	1,031	1,049	1,070	1,085	1,095	1,099	1,078	1,042
	Total	2,233	2,333	2,419	2,497	2,568	2,578	2,612	2,587	2,530

Figure 9: *Employment and turnover for service and supply sectors 2009 to 2017 (employment – LHS, turnover – RHS)*

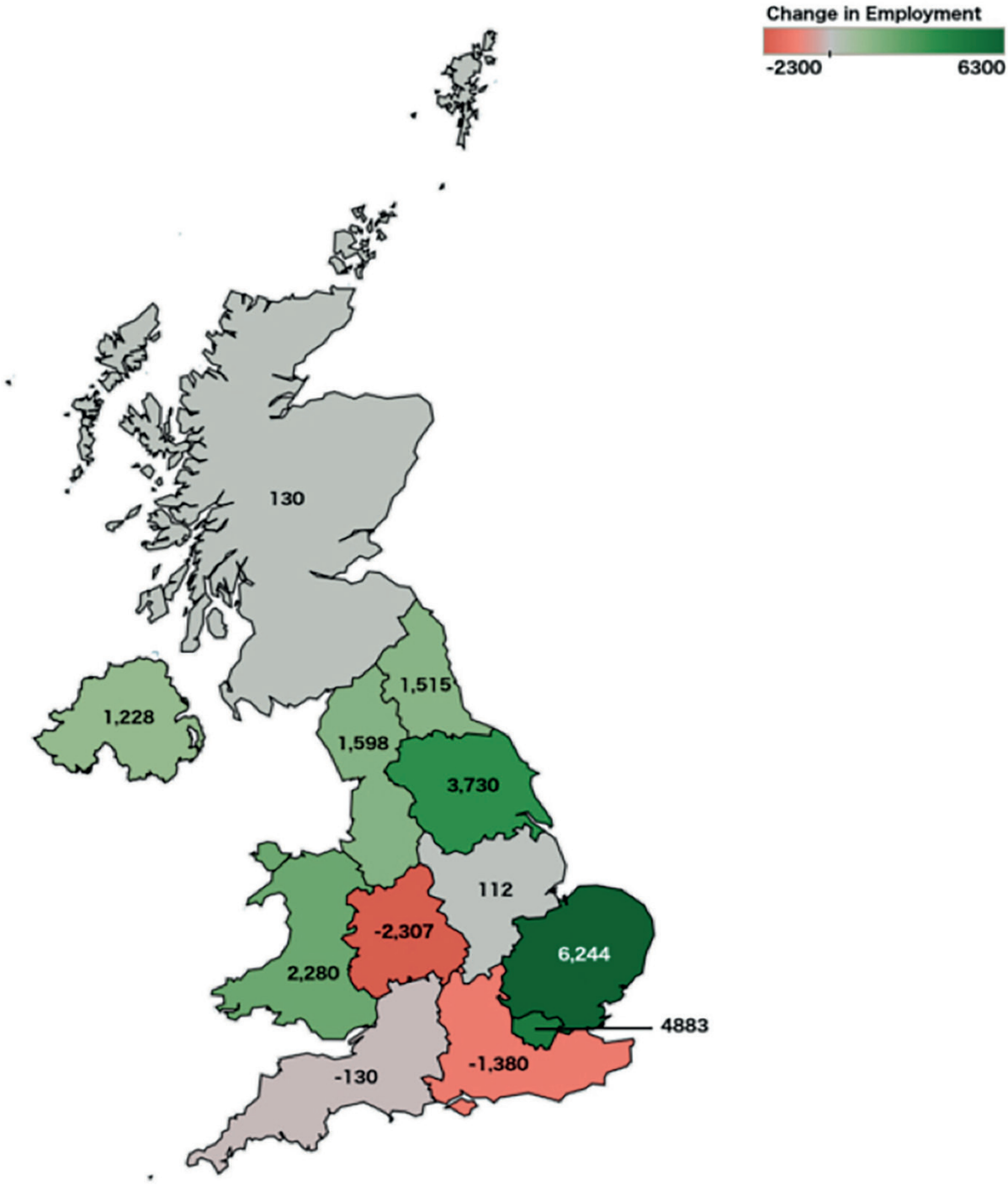


- The Top 3 segments by employment in the Medtech service & supply sector in 2017 were: consumables and equipment suppliers; contract manufacturing and research organisations; and specialist consultants. Together these 3 segments accounted for 54% of the sector employment in 2017- a small decrease from 57% in 2009.
- The specialist consultant segment showed the largest increase in employment in the sector over the period of 990, a 41% increase since 2009.
- The Top 3 segments in the Medtech service & supply sector in 2017 by turnover were: consumables and equipment suppliers; contract manufacturing and research organisations; and recruitment companies. Together these segments account for 53% of the sector turnover in 2017, a 4% decrease since 2009.

1.7 Geography

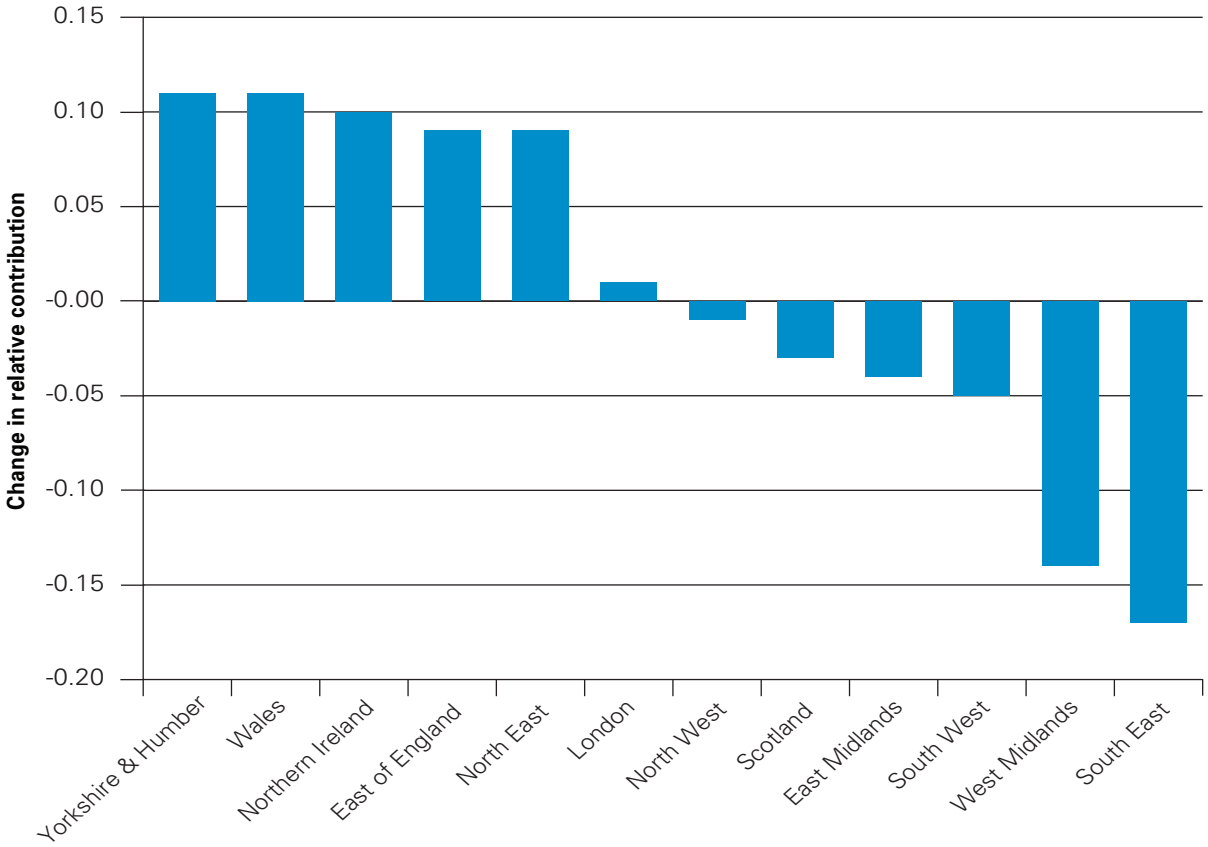
- The distribution of employment in the life science industry across the UK has changed between 2009 to 2017, however the data indicates that, for the industry as a whole, there has not been a significant increase in concentration in the South East of England.
- London, the South East and East of England combined had a net increase in employment of 9,750 (8.8% increase since 2009) while the rest of England, Northern Ireland, Scotland and Wales had a net increase of 8,160 (6.9% increase since 2009). This is in contrast to the change in distribution of sites over the period where there was a net increase of 345 sites in the three regions of London, the South East, and East of England but a decrease of 31 sites across the rest of the UK.
- London was the single largest region for increases in the number of sites with 247 new sites between 2009 and 2017, the majority of which were in the core Medtech sector. This is compared to the West Midlands with a net loss of 71 sites, also mainly in the core Medtech sector.
- The pattern of changes in employment show some differences to that observed for sites. The East of England has seen the largest increase in employment with a net additional 6,200 jobs, followed by London with an additional 4,900 jobs.
- Only two regions showed large falls in employment, the West Midlands with a reduction of 2,310 followed by the South East with 1,380. The South West also saw a small fall in employment. All other regions showed increases in total life science employment between 2009 and 2017. See Figure 10 for all the regional changes shown on a map of the UK.

Figure 10. *Geography of the net changes in life sciences employment 2009 to 2017*



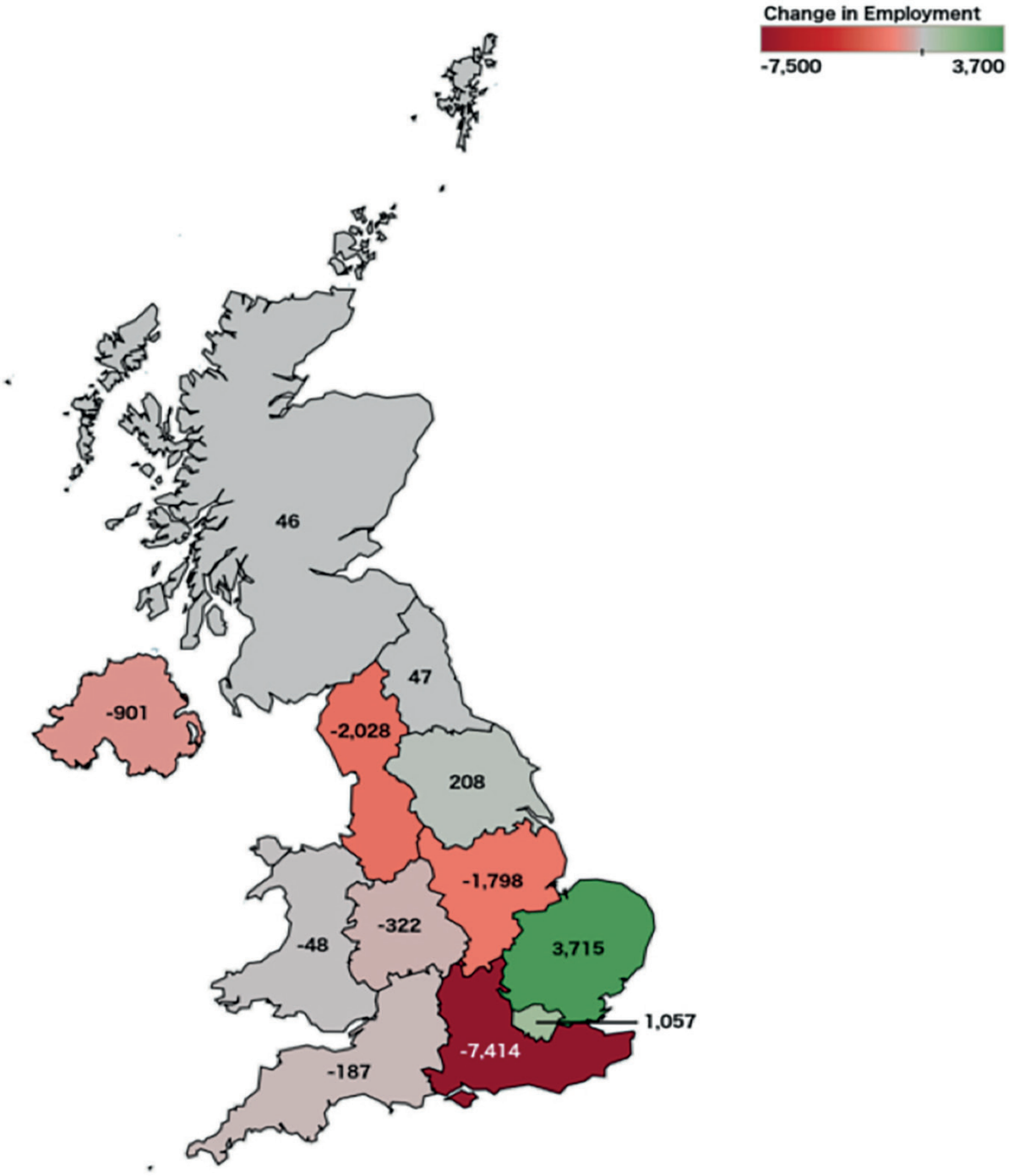
- By comparing the net change in life science employment in a region with the overall change in employment over the same period, we can assess whether the changes in a region have increased or decreased the importance of the life science industry in that region. This analysis reveals that Yorkshire and the Humber and the North East of England along with Northern Ireland and Wales increased the relative contribution of the life science industry to overall employment. London and the North West of England saw small changes, while in all other regions and Scotland there was a decrease in the relative importance of life science employment to overall employment.

Figure 11. *Change in relative contribution of life science industry to total employment by region – 2009 to 2017*



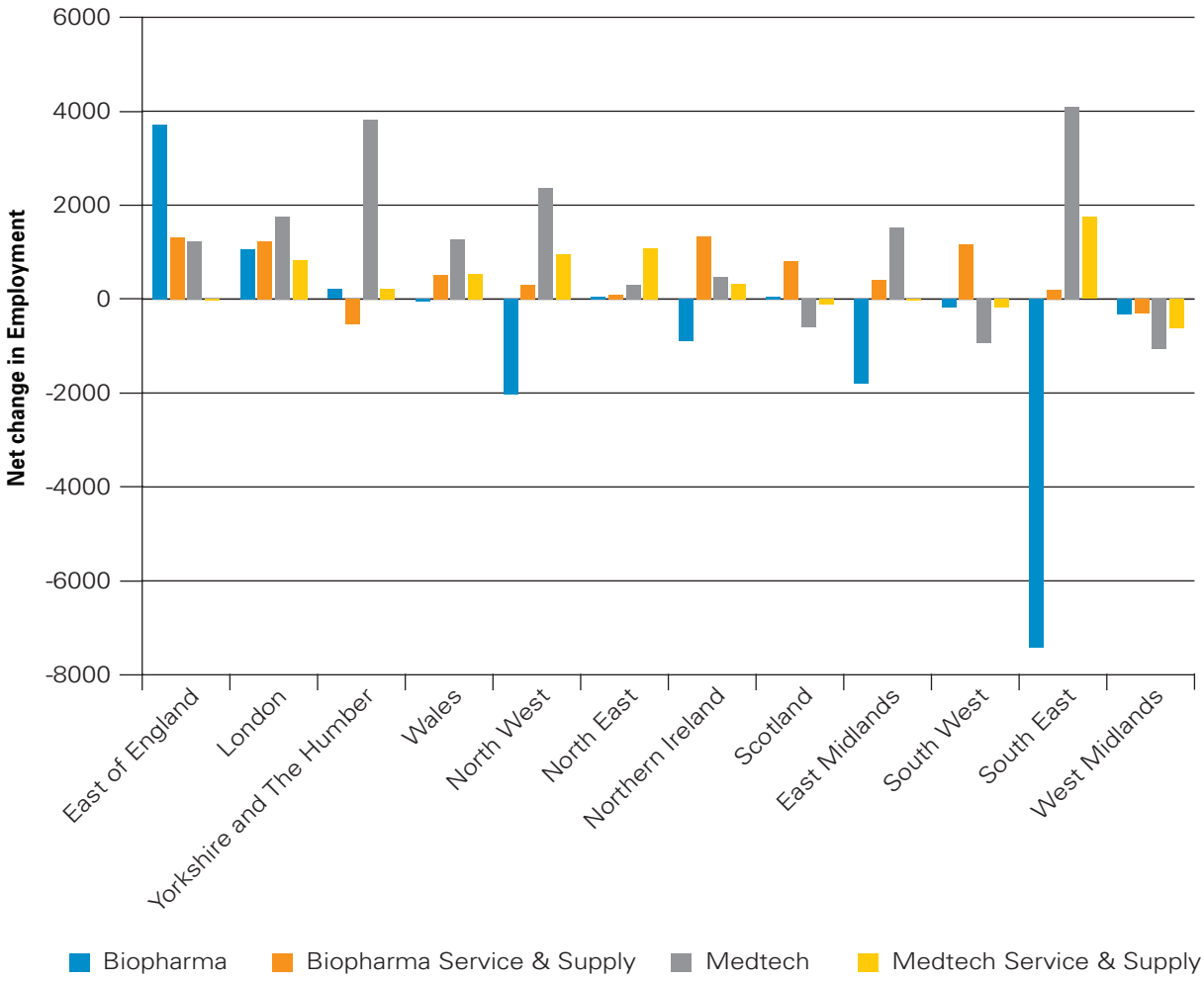
- Looking in more detail at the regional movement, at a sector level there is some evidence to support a trend of movement of the core Biopharma activity towards the East of England and London as shown in Figure 12.

Figure 12. *Geography of the change in relative contribution of the core Biopharma sector to total employment by region – 2009 to 2017*



- Further analysis of the changes in employment reveal changes in sector employment by region. As shown in Figure 13, all regions recorded net changes in all sectors although there are sectors that dominated the change in each region. This suggests that for life sciences as a whole there is limited evidence suggesting a geographical shift towards the south east of the UK.

Figure 13. *Change in employment by sector and region 2009 to 2017*



- Further analysis of the business activity at sites gives further detail on the changes that account for the majority of net employment change by region and this analysis is summarised in Table 6.

Table 6. *Summary of the major changes in sector employment and business activity underlying the net change in employment by region*

Region	Major changes in Life Science employment
North East	Significant increase in Medtech service & supply employment (1,100), primarily in sales & service activity.
North West	Significant increase in core Medtech (2,360), mainly in sales & service activity but also R&D and manufacturing. This has been balanced by a fall in core Biopharma (2,030) with falls in both R&D and sales & service.
Yorkshire and The Humber	Significant increase in core Medtech (3,820), the majority of which has been in manufacturing.
East Midlands	Increase in core Medtech (1,530), mainly in R&D and manufacturing. This has been balanced by a fall in core Biopharma (1,800) mainly in sales & service.
West Midlands	Moderate falls in all sectors (300-1,070), most notably in manufacturing for core Medtech and Medtech service & supply.
East of England	Significant increase in core Biopharma (3,700) mainly in R&D.
London	Moderate to significant increases across all sectors (830-1,760), with the majority of increase in sales & service activity for all sectors.
South East	Significant fall in core Biopharma (7,400) across R&D, sales & service and particularly manufacturing. This has been partially balanced by increase in core Medtech manufacturing and sales & service.
South West	Moderate increase in Biopharma service & supply (1,170) in R&D, manufacturing and particularly in sales & service. This has been balanced by a fall in core Medtech manufacturing.
Wales	Moderate increases (520-1,270) in all sectors except for core Biopharma most increases in sales & service activity
Scotland	Moderate increase in Biopharma service & supply (800), mainly in R&D that has been balanced by a fall in core Medtech sales & service.
Northern Ireland	Increase in Biopharma service & supply (1,330), mainly in sales & service that has been balanced by a fall in core Biopharma manufacturing.

1.8 Timeline of events

- The trends described in this report should be situated in context. A short timeline of political and life sciences-specific events is detailed below. This does not attempt to explain causality or justify the trends detailed above and should be viewed as contextual information only.

Date	Event
May 2010	UK General Election
Autumn 2010	Formation of Local Enterprise Partnerships (LEPs) in England
December 2011	Strategy for UK Life Sciences published
Duration of 2012	City Deals wave 1 (8 cities)
Duration of 2013	City Deals wave 2 (18 cities)
March 2014	Formation of the Office for Life Sciences
Late 2014 to early 2015	Devolution Deals (3 city regions)
May 2015	UK General Election
Duration of 2015	Growth Deals (39 LEPs)
February 2017	Scottish Life Science Strategy published
June 2016	Referendum on UK leaving the European Union
June 2017	UK General Election
August 2017	Life Sciences Industrial Strategy published
December 2017	Life Sciences Sector Deal launched

Chapter 2

Methodology

Over the nine years in which the *Strength and Opportunity* series has been published, the scope of the project has been expanded and amendments to methodology and definitions have been made. This means that the annual datasets are not fully comparable between years and so long-term trend analysis would not be on a like-for-like basis. Recognising the user need for a robust time series, we investigated options to improve our annual datasets by making them comparable over time.

This supplemental report utilises a new methodology to create comparable annual datasets based on the same scope and definitions, from which we can draw a narrative on the changing nature of the life sciences industry in the UK between 2009 and 2017.

In anticipation of this supplemental report which would be based on our 'new' trends methodology, we did not update the five-year trend analysis using the 'old' methodology in the main *Strength and Opportunity 2017* report published in May 2018.

This chapter details the 'old' and 'new' methodologies, explains the differences between them, and details our intended approach in future years.

2.1 'Old' methodology – annual reports pre-2017

2.1.1 In each annual report, we included a section on 'real growth' or a 'like-for-like comparison' between the previous and current year. This continued in the main 2017 report, updated with the 2016 to 2017 like-for-like comparison.

2.1.2 'Real growth' is calculated by removing changes in employment or turnover associated with the addition of businesses that were formed more than 12 months before the update and not included in the previous year's dataset. Data for businesses that are re-classified as not in scope (NIS), duplicates, or those were previously classified as ceased trading but now trading are also excluded.

2.2 'New' methodology – 2017 supplemental report

2.2.1 As discussed earlier, the issue with comparing the annual snapshot datasets is that changes to the scope, definitions and methodology since the outset of the *Strength and Opportunity* series in 2009 result in not comparing like with like.

2.2.2 These changes included:

- Segmentation review for all businesses and sites – 2014 report;
- Country of ownership methodology update to include FAME data – 2014 report;
- Merging of 'Pharmaceutical' and 'Medical Biotechnology' sectors into 'Biopharmaceuticals' – 2015 report;
- Digital health review, leading to substantial increase in number of digital health businesses and sites captured in the database – 2015 report;
- Genomics flag creation – 2015 report;
- Moving to the EU definition for SMEs (see terminology in Annex 1) from a definition of fewer than 250 employees – 2017 report.

2.2.3 The 'new' methodology sources additional information for all businesses in the most recent database (2017) to backfill historical data for these companies. This backfilling approach creates a like-for-like snapshot for each year from 2009 to 2017 from which we can observe trends.

2.2.4 For instance, the inclusion of digital health businesses in 2015 meant that a substantial number of sites that were already active and had been generating turnover and jobs prior to 2015 were now being counted in the life sciences industry totals. By backfilling historical data for these additional businesses, we can recalculate the total life sciences turnover and employment estimates for the years 2009 to 2014 including these businesses.

2.2.5 To source additional economic information (employment and turnover), we used third-party sources including Dun & Bradstreet (D&B), FAME and published company-filed accounts or reports. These are the same sources as used for the construction of the main annual dataset. Where economic data could not be sourced from company-filed accounts, an algorithm was used to populate the dataset based on growth profile averages for individual segments.

2.2.6 To source additional segmentation information, we use company reports and information available via Internet searches. This was necessary to align definitions, e.g. the merging of the 'Pharmaceutical' and 'Medical Biotechnology' sectors into 'Biopharmaceuticals' in the 2014 report.

2.2.7 To source additional information on SME status to bring the definition used in previous datasets in line with that used in the 2017 database, we sourced information from D&B. This is the same source as was used in the 2017 database.

2.2.8 We used GDP deflators[5] to take account of inflation across the years. We also adjusted for population demographics to take account of the changing size of the potential workforce.

2.3 Conclusion – 2018 report onwards

2.3.1 As expected, the 'new' methodology allowed creation of a series of like-for-like annual datasets from which we could analyse trends in the key variables of interest in a more robust manner than our previous methodology allowed. We intend to use this 'new' methodology in subsequent years.

2.3.2 With the backfilling exercise completed for 2009 to 2017, in future years we will only need to backfill information for new businesses and sites added to that year's annual dataset. These shorter timescales allow us to include trend analysis as chapters within the main annual report again but utilising the 'new' methodology.

2.3.3 The next update to this trend analysis will be in *Strength and Opportunity 2018*, due to be published in Spring 2019.

5 https://www.gov.uk/government/collections/gdp-deflators-at-market-prices-and-money-gdp

Annex 1

Terminology

Industry is the term used to collectively describe all Sectors covered in the analysis

Sector is the term used to describe Core Biopharma, Core Med Tech, Biopharma Service & Supply, or Med Tech Service & Supply

Segment is the term used to describe the individual product or service groups within a Sector (see Annex 2 for the detail description of segments)

"Core Biopharma" includes all businesses involved in developing and/or producing their own pharmaceutical products – from small, R&D-focused biotechs to multinational Big Pharma.

Biopharma Service & Supply comprises businesses that offer goods and services to Core Biopharma businesses including for example Contract Research and Manufacturing Organisations, suppliers of consumables and reagents for R&D facilities.

"Core Med Tech" includes all businesses whose primary business involves developing and producing Med Tech products (ranging from single-use consumables to complex hospital equipment, including digital health products).

Med Tech Service & Supply sector comprises businesses that offer services to Core Med Tech businesses including, for example, Contract Research and Manufacturing Organisations, suppliers of consumables and reagents for R&D facilities.

Digital health includes businesses involved in making products for both hospitals and consumers including products such as hospital information systems and mobile medical devices and apps. It is a segment within the Med Tech Sector.

Genomics is an interdisciplinary field focusing on the study of the human genome and the application of resulting knowledge to human health. It is a cross-cutting categorisation across all four sectors.

Business is used to describe the entity that is the legal owner of a group of trading addresses or sites and legal entities. A business may consist of more than one site or registered company. The term business is used in this document when discussing the whole life science industry and the four sectors. In 2017 there are 107 businesses that are active in more than one sector, which means there is a small difference in the count of businesses at the industry level compared to the sector level. There is no difference in the sums of employment or turnover at the different levels of analysis.

Sites is used when referring to the data at the segment or geographical level. All of the data in the spreadsheets that accompany this document are analysed at the site level. This is the level at which all data entries are held and analysed in the database. A single site is segmented and has employment and turnover assigned to it. As a business can have multiple sites and can operate in more than one segment the total counts of sites at segment level is greater than the count of businesses referred to at sector level.

SME status is based on the European definition of Small and Medium-sized Enterprises and refers to businesses with fewer than 250 employees and which either have annual turnover up to and including €50m and/or have an annual balance sheet total up to and including €43m, and are not part of a Non-SME ownership group.

Annex 2

Segmentation codes

Biopharma	
Code	**Description**
BPA	Antibodies
BPB	Therapeutic Proteins
BPC	Advanced Therapy Medicinal Products (ATMPs)
BPD	Vaccines
BPE	Small Molecules
BPF	Blood and Tissue Products
BX01-18	Supply Chain

Service & Supply Chain[6]	
Code	**Description**
X1	Clinical Research Organisation
X2	Contract Manufacturing/Research Organisation
X3	Contract Formulation Manufacturing
X4	Assay developer
X5	Analytical Services
X6	Formulation/Drug delivery specialist
X7	Reagent, Equipment and consumables supplier
X8	Regulatory Expertise
X9	Patent and Legal specialist
X10	Logistics and Packaging
X11	Information systems specialists
X12	Tissue and Biomass
X13	Specialist consultants
X14	Contract design
X15	Training
X16	Recruitment
X17	Investment Businesses
X18	Healthcare services

Medical Technology	
Code	**Description**
MTA	Wound care and Management
MTB	In vitro diagnostic technology
MTC	Radiotherapy equipment
MTD	Medical Imaging/Ultrasound/and Materials
MTE	Anaesthetic and respiratory technology
MTF	Orthopaedic Devices
MTG	Cardiovascular and vascular devices
MTH	Neurology
MTI	Opthalmic Devices/Equipment
MTJ	Dental and maxillofacial technology
MTK	Drug Delivery
MTL	Infection Control
MTM	Surgical Instruments (reusable)
MTN	Single use technology nec
MTO	Re-usable diagnostic or analytic equipment
MTP	Implantable devices nec
MTQ	Assistive Technology
MTR	Mobility Access
MTS	Hospital hardware including ambulatory
MTT	Digital Health
MTV	Education and Training
MX01-18	Supply Chain

6 Codes for Biopharm and Med Tech sectors covering the Service & supply segments are prefaced with BX and MX respectively e.g. Medtech Clinical research organisation is coded as MX1.

Digital Health		
Sub-segment code	**Description**	**Detailed Description**
MTT1	Hospital information systems	Secondary health system-held medical record systems are electronic versions of traditional paper records – often abbreviated to EHR. Includes provider-provider communication systems, e-prescribing
MTT2	GP Information Systems	Primary health system-held medical record systems are electronic versions of traditional paper records – often abbreviated to EHR. Includes provider-provider communication systems, e-prescribing
MTT3	Social Alarms / Communications devices	Telecare - support and assistance provided at a distance using ICT, such as fall alarms and medicine management delivered over hard-line or mobile platforms
MTT4	Personal Medical Records	Systems for patients to hold their own medical information
MTT5	Telemed (medical monitoring) and telediag	Telehealth - the remote exchange of clinical data between a patient and their clinician delivered over hard-line or mobile platforms. Includes video consultation and remote monitoring of health parameters such as blood pressure.
MTT6	E-health – data analytics	• Software and infrastructure to enable analysis of health and medical Big data. Applications included: • To support clinical decision-making: enabling clinicians to make evidence-based clinical decisions about patient care • Pathway design: using population level analysis to help redesign clinical pathways • Commissioning: developing standard frameworks and models for innovative commissioning/ funding • Drug assessment: the long-term use of real world evidence to support drug development and approval. • Performance management: prioritising resource allocation and measuring key performance metrics to better manage finances within the healthcare system.
MTT7	Digital Medical Electronics	Devices that conduct monitoring of body activity internal or externally, are wireless and incorporate sophisticated software that involves enables a high degree of operation independent of human intervention
MTT8	Professional Mobile health devices	Mobile devices that are applied in a clinically setting (can include embedded software or interface with independent software)
MTT9	Professional Mobile health services/apps	Clinically-led apps that manage medium to high confidentiality data (health data and personal medical records); these are used by clinicians, patients or hospital system reporting to aid prevention, diagnosis, and/or monitoring of disease
MTT10	Consumer Mobile health devices	Consumer-led fitness and wellbeing devices that monitor basic body functions such as activity levels, heart rate and blood pressure
MTT11	Consumer Mobile health services/ apps	Consumer-led fitness and wellbeing apps that handle low-confidentiality data (personal wellness and activity data) and are usually a consumer-driven purchase, includes services to store consumer data in the cloud and provide health advice based on the data

Genomics				
Main	**Main Value chain**	**Description**	**Sub-tag code**	**Sub-tag chain activity**
Tagging code	**Activity**			
GenA	Sampling	The process of collecting and packaging samples (e.g. saliva, blood). The kits used to collect DNA samples are fairly simple.	GenA1	Consumables
GenB	Sequencing	Decoding the order of the nucleotides in a genome. DNA sequencing on a large scale is done by high-tech machines	GenB1	Consumables
			GenB2	Instruments
			GenB3	Services
GenC	Analysis	The process to identify disease-causing variants, often run by bioinformatics software.	GenC1	Data cleansing
			GenC2	Variant Analysis
			GenC3	Database services
GenD	Interpretation	Taking analysed information and providing clinically useful interpretations and results	GenD1	Reporting
			GenD2	Link with EHRs
			GenD3	Tailoring results
GenE	Application	The process of directly using genomic information to improve targeting of clinical services	GenE1	Drug development
			GenE2	Clinical Services
				Diagnostics
GenX	Activities not elsewhere classified	A segment where companies that are not clearly assigned to GenA-E should be placed. When this group becomes large it will be examined to see if new segments are required	N/A	N/A

Annex 3

Full Data partners acknowledgement statement

A3.1 The Office for Life Sciences gratefully acknowledge the contribution of the following regional and national organisations in the compilation of the Health Life Sciences Database.

A3.2 The content of the database has been derived from a variety of proprietary data sources which have been provided under license. The Office for Life Sciences would like to acknowledge the assistance given by the owners of these data sources.

A3.3 Business Information was accessed under license by Dun & Bradstreet Limited and the FAME database from Bureau van Dijk Electronic Publishing.

A3.4 The database construction, data integration, data analysis and commentary preparation was completed by a consortium led by Cels Business Services (CBSL) Ltd. The consortium included Kepier Ltd and Lindum Ltd (data integration and analysis).

A3.5 Data Partners

- Association of British Healthcare Industries (ABHI)
- Association of the British Pharmaceutical Industry (ABPI)
- AXREM
- BioIndustry Association (BIA)
- Bionow
- Biopartner
- Biosciences Knowledge Transfer Network (KTN)
- British Healthcare Trade Association (BHTA)
- British In Vitro Diagnostics Association (BIVDA)
- HealthTech and Medicines Knowledge Transfer Network (KTN)
- Innovate UK
- Invest Northern Ireland
- Medcity

- Medilink East Midlands
- Medilink North of England
- Medilink West Midlands
- Medilink South West
- MediWales
- OBN
- One Nucleus
- Scottish Enterprise
- South East Health Technologies Alliance (SEHTA)
- TechUK
- Welsh Assembly Government

Annex 4

Data Quality Principles

As with the *Strength and Opportunity 2017* main report, whilst this report is not Official Statistics we aim to collect data and present this report in line with principles of the Code of Practice for Statistics[7] to engender trust in our data and encourage the use of this report as a reliable source of life sciences data.

This data quality statement covers the fourteen principles under the three pillars of the Code: trustworthiness, quality and value.

A4.1 Trustworthiness:

A4.2 **T1: Honesty and integrity** – Data is collected, processed and quality assured by an independent contractor. The initial technical specification is set by professional statisticians with the Office for Life Sciences (OLS) who also engage regularly with the contractor, review methodological aspects, and undertake further quality assurance checks before publication.

A4.3 **T2: Independent decision making and leadership** – OLS statisticians abide by the Code of Practice, keeping pre-publication access to the data to those involved in the report's creation and ensuring the statistical integrity of content. The Department's Head of Profession for Statistics is engaged when necessary.

A4.4 **T3: Orderly release** – Pre-publication access to the report is restricted to those involved in the report's creation and publication. The report meets GSS standards of statistical impartiality, separating statistical commentary from any political, press or ministerial statements. Subsequent statements by the government using data from this report quote this source and non-governmental users are encouraged to do the same. Unscheduled corrections are released as soon as is practicable, alongside an explanatory note on both the cause and impact of the error, in line with the Code of Practice.

A4.5 **T4: Transparent processes and management** – Substantial financial and administrative resources are employed to enable this data collection and effective quality assurance, including a proportion for further development of the report each year in light of new user requirements or new methodology / collection possibilities. We are transparent about our methodology and approach to quality, as evidenced in Chapter 2 of this report and Annex 2 of the main 2017 report.

7 https://www.statisticsauthority.gov.uk/code-of-practice/

A4.6 **T5: Professional capability** – Data is collected, processed and quality assured by a consortia contractor. Each individual has appropriate analytic capabilities, data protection awareness and industry-specific expertise, and has been involved in the production of the report for several years. The report 'owners' within OLS are professional GSS-badged statisticians.

A4.7 **T6: Data governance** – All professionals involved in the creation, publication and storage of this dataset are well-versed in data protection and operate in compliance with data protection legislation. We publish the maximum amount of data available without contravening third-party licence agreements, utilising GSS best practice for statistical disclosure control (e.g. banding commercially sensitive variables).

A4.8 Quality:

A4.9 **Q1: Suitable data sources** – Description of methodologies used in this trend's publication, including a description of third-party administrative data sources and their suitability, can be found in Chapter 2. More detailed methodology on the full process of creating the annual snapshot datasets can be found in Annex 2 of the main *Strength and Opportunity 2017* report. This also contains a comparison between the health life sciences database and ONS SIC codes, the main alternative source. An explanation of counting levels to ensure users are clear at what level figures are presented (e.g. businesses vs. sites) in Annex 2 and a glossary defining key terms in Annex 1.

A4.10 **Q2: Sound methods** – The purpose of this report is to explore and improve methodologies for producing robust long-term trend analysis. Chapter 2 details the methodologies used in this supplemental report, with the full methodology for creating the annual datasets in Annex 2 of the main *Strength and Opportunity 2017* report. Terminology is consistent through the report and accompanying files, with clear descriptions in the glossary in Annex 1.

A4.11 **Q3: Assured quality** – Rigorous quality assurance has been undertaken by the contractor, OLS statisticians and an external business analyst within the wider Department. Quality assurance is a significant part of the technical specification and contract tendering process and is reviewed each year. When an unscheduled revision was necessary following the post-publication identification of an error in a previous report (2016), we immediately alerted users, engaged with the Department's Head of Profession for Statistics, and published an explanation of the cause and impact of the error alongside the revised report, all in accordance with the Code of Practice.

A4.12 Value:

A4.13 **V1: Relevance to users** – This supplemental report has been produced in response to an identified user need for robust long-term time series data on the life sciences industry in the UK. In response to user feedback on the 2016 main report, for the 2017 main report we have further extended the

fields in the publicly available underlying businesses dataset to include all fields for which we are not restricted by commercial licences. In particular, we now include a unique reference number for each site. We have continued to apply this approach to this supplemental report.

A4.14 **V2: Accessibility** – Data is free and equally available to all, published on gov.uk with no restrictions to access. Underlying data is published up to the extent our commercial licenses allow, with banded variables where we cannot provide exact figures. Commentary is objective, and a range of graphical visualisations are used to aid comprehension.

A4.15 **V3: Clarity and insight** – Commentary on the current size and shape of the life sciences sector is objective, focussing on impartial statistical messages. Charts and maps are used to illustrate these. Key statistical messages are highlighted up front. The underlying database is created through collaboration with a range of industry experts, including region-specific and sector-specific representation through trade bodies and other network organisations.

A4.16 **V4: Innovation and improvement** – The purpose of this supplemental report is to improve our ability to understand long-term trends in the UK life sciences industry. It utilises a new methodology to create a dataset allowing like-for-like comparisons to be made in order to conduct robust trend analysis.

A4.17 **V5: Efficiency and proportionality** – Where possible, the database draws on existing information using third party sources, such as the D&B and FAME datasets and company accounts. All data partners are voluntary contributors. The need for the underlying health life sciences database and report arises from the difficulty in identifying the life sciences sector from already-existing ONS sources since they use SIC codes, which do not encapsulate the full extent of the life sciences. In particular, as SIC codes were last refreshed in 2008 they do not allow easy identification of new and emerging segments within the medical technology sector, such as digital health. The public good of a robust evidence base on the size and shape of the UK life sciences sector is deemed of suitable value to warrant the creation of this additional dataset and report. The additional resource to undertake the trend analysis described in this report is justified by the creation of robust long-term trends and the identified user need for this narrative.

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