NHS England

Diagnostic Imaging Activity Comparisons 2013/14

Diagnostic Imaging Activity Comparisons 2013/14

Comparing DID with KH12 and DM01

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Frequently used acronyms

Acronym	Full name
DID	Diagnostic Imaging Dataset
DM01	Monthly Diagnostic Waiting Time and Activity Return
KH12	Annual Imaging and Radiodiagnostic Return
NICIP	National Interim Clinical Imaging Procedure
RIS	Radiology Information System
SNOMED-CT	Systematised Nomenclature of Medicine - Clinical Terms

Contents

1 Background

NHS England currently publishes three data collections which provide information about the number of imaging tests undertaken in the NHS in England; the Annual Imaging and Radiodiagnostics collection (KH12), the Monthly Diagnostic Waiting Times and Activity collection (DM01) and the Diagnostic Imaging Dataset (DID).

1.1 Annual Imaging and Radiodiagnostics collection (KH12)

The Annual Imaging and Radiodiagnostics collection (KH12)[1] is a provider submitted aggregate return of imaging and radiodiagnostic procedures undertaken on patients throughout the year. It counts imaging or radiodiagnostic events[2] for seven modalities: X-rays (radio-graph), CT Scans, MRI Scans, Ultrasounds (split between obstetric and non-obstetric), Fluoroscopy and Radio-isotope (nuclear medicine). The KH12 has published data each year since 1995 and holds a National Statistic badge.

1.2 Monthly Diagnostic Waiting Times & Activity collection (DM01)

The Monthly Diagnostic Waiting Times and Activity collection (DM01)[3] is primarily used to measure performance against the diagnostic waiting times operational standard. It is an aggregate return submitted each month by providers, with commissioner sign off from Clinical Commissioning Groups (CCGs). Unlike the KH12 and DID, the DM01 covers a wider variety of diagnostic procedures than just imaging, including endoscopy and physiological measurements. For imaging, it collects activity data[4] for CT Scans, MRI Scans, Non-obstetric ultrasound, Barium enema and DEXA scans. DM01 has been published on a monthly basis since 2006.

1.3 Diagnostic Imaging Dataset (DID)

The Diagnostic Imaging Dataset[5] is a relatively new collection, starting April 2012. It is a provider submitted return covering detailed imaging test codes, which may be grouped into numerous modalities including X-rays, CT Scans, MRI Scans and Ultrasounds. Unlike the other returns, the DID is a patient level collection which allows for far greater granularity and offers richer data for analysis. The DID is currently classified as Experimental Official Statistics and is published on a monthly basis. One of the long term aims of the DID was to replicate and ultimately replace the KH12.

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[1] See http://www.england.nhs.uk/statistics/statistical-work-areas/diagnostics-waiting-times-and-activity/imaging-and-radiodiagnostics-annual-data/

[2] The NHS Data dictionary defines 'Imaging or Radiodiagnostic Event' as “a test or examination performed using one Imaging Modality, in response to one Diagnostic Test Request and relating to one Anatomical Site. A test counts as one test if one report is issued regardless of the number of radioactive substances used and the number of days on which counting takes place.”

[3] See http://www.england.nhs.uk/statistics/statistical-work-areas/diagnostics-waiting-times-and-activity/monthly-diagnostics-waiting-times-and-activity/

[4] For DM01, a unit of activity is defined as a distinct clinical test/procedure (although there might be multiple scans within each distinct test) and is identified as Waiting list, Planned (surveillance) or Unscheduled.

[5] See http://www.england.nhs.uk/statistics/statistical-work-areas/diagnostic-imaging-dataset/

2 Definitional comparison

Whilst the three collections all collect imaging activity date for similar modalities, they do not all define activity in the same way. In particular, there are certain procedures that would be counted as two imaging procedures on KH12 and DM01 but only one on DID. For example an MRI scan on both ankles would be recorded as two scans in KH12 (two anatomical sites) but would be coded as an MRI Scan on both ankles in DID and thus only count as one imaging procedure. However, by using a body site multiplication factor, it is possible adjust the DID data for these types of procedures to give a more accurate comparison. Such a multiplication factor has been derived for each individual NICIP code (or SNOMED-CT) and applied to the DID imaging counts for this analysis. This increased the activity in all modalities, ranging from +2% for Nuclear Medicine to +46% for CT Scans.

This adjustment addresses the first reason for possible difference between the returns, but there are other reasons as listed:

- **Method of counting**: Trusts might record the number of imaging sites in KH12 and number of procedures in the DID. The DM01 focus on patients for waiting times may also affect the way its activity is reported.
- **Aggregation differences**: For the KH12, providers calculate an aggregate figure for each modality. Some organisations may use different coding systems and aggregations which result in different totals from a non-aggregate return (the DID).
- **Use of local coding systems**: Some providers may have used local imaging codes that have not been mapped to either a NICIP or SNOMED-CT (which is used in DID), resulting in differently counted modalities.
- **Underrepresentation of specific test**: There is some evidence to suggest that certain providers may have not been submitting particular imaging procedures to the DID, however this is believed to be improving as the collection becomes more mature.
- **Difference in scope**: The DID and DM01 only collect information about NHS funded patients, whereas KH12 may include other patients treated in NHS providers. The DID covers activity recorded on the Radiology Information System (RIS), whereas KH12 and DM01 may include imaging information not held on RISs. Also KH12 specifically excludes imaging performed as part of radiotherapy planning.
- **Difference in coverage**: There are differences in the modalities and the list of organisations for each collection. Some allowances can be made for this to compare like with like, but since provider and submitter organisations may differ it is not always possible to identify the same activity.
- **Difference in timeliness**: The DID is finalised just over six months after the end of each month, DM01 is finalised around six weeks after the end of the month and the KH12 is collected just over 3 months after the end of the full year. This allows different opportunities for validation and revision by the providers.
- **Experimental nature of the DID**: The DID is still classed as an experimental statistic and there is incomplete reporting from some providers.

2.1 Comparisons presented

Despite the definitional differences above, which it is not always possible to adjust for, the DID adjusted activity for 2013/14 has here been compared with the KH12 and DM01 activity counts for the year. This updates and extends the information published in the DID 2013/14 Technical Report[6], which pre-dated the adjustment of DID using body site exam multipliers. There are six modalities that are present in both KH12 and DID and can be directly compared. These are: CT, MRI, Ultrasound (total), Nuclear Medicine/Radioisotopes, X-ray and Fluoroscopy.

There are two modalities that are included in the both DM01 and DID and can be directly compared. These are CT and MRI. Whilst ultrasound is present in both collections, only non-obstetric is record in DM01. The decision was taken here to not split the DID ultrasound data into obstetric and non-obstetric due to concerns with the method of filtering the tests into the relevant groups. Two remaining imaging modalities in DM01, DEXA Scan & Barium Enema, fall under larger modalities in the DID (X-ray and Fluoroscopy respectively) so this analysis did not attempt to split the data out for these smaller sub modalities.

The comparison is made at national level and then at provider level using matched providers (i.e. providers that are present in both collections). There are 165 trusts present in both KH12 and DID and 161 trusts present in both DID and DM01. The decision was taken to remove independent sector (IS) providers from the provider level comparison, even if they were present in both collection, because of the variation in how IS activity is reported. Within DM01 IS providers tend to submit under smaller site level codes whereas in KH12 and DID they submit under the main organisation code. In addition, some IS sites submit all activity independently whereas others may be outsourced to, or submitted with, an NHS Trust. Although DID differentiates between the submitter and the provider organisation, this may lead to differences for IS activity between the collections.

To compare the collections, ratios of activity are calculated. A ratio of 1.0 indicates a perfect match between the two collections.

[6] *Monthly Diagnostic Imaging Dataset Statistics – Technical Report Version 3*, 2013-14

3 Results

3.1 Comparing KH12 and DID

There is generally a good level of comparison between KH12 and DID, with KH12 being 2% higher overall for the modalities present in both collections (see Table 1). Within this total, KH12 is significantly higher in three modalities: Ultrasound (+13%), Nuclear Medicine / Radioisotopes (+37%) and Fluoroscopy (+24%). DID is marginally higher in the other three modalities: CT Scans (+7%), MRI Scans (+9%) and X-ray (+1%). KH12 excludes scans performed for radiotherapy planning, which may particularly reduce its count of CT scans compared to the DID.

Table 1. Number of imaging tests by collection and comparison ratio, 2013/14

	All Modalities	CT Scans	MRI	Ultrasound	Nuclear Medicine / Radio-isotopes	X-ray	Fluoro-scopy
KH12	42,921,032	5,193,233	2,741,489	9,972,418	624,581	23,054,170	1,335,141
DID	42,088,849	5,535,861	2,999,601	8,805,410	456,553	23,215,049	1,076,375
Ratio	1.02	0.94	0.91	1.13	1.37	0.99	1.24

Note: A ratio of less than 1 indicates DID is higher, a ratio of greater than 1 indicates KH12 is higher

Restricting to the 165 trusts present in both collections makes the difference between the two collections a bit more pronounced (see Table 2). However, where DID activity was reported against subsequently discontinued provider codes, it was not always possible to match to the annual KH12, so overall 1.5 million imaging tests were removed from DID but only 250,000 from KH12.

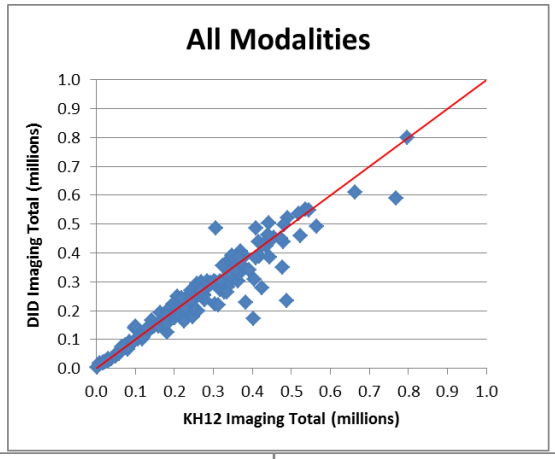
Table 2. Number of imaging tests by collection and comparison ratio, 2013/14 (165 trusts for comparison)

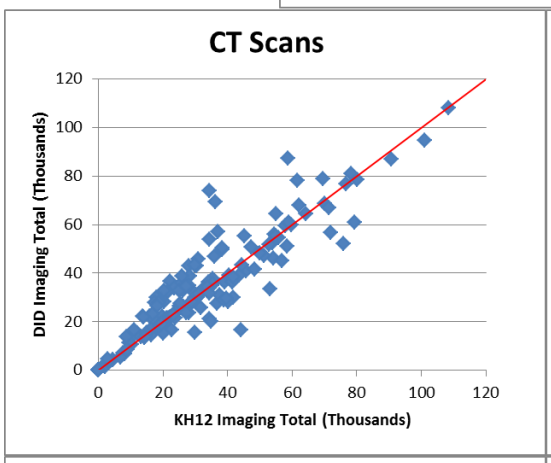
	All Modalities	CT Scans	MRI	Ultrasound	Nuclear Medicine / Radio-isotopes	X-ray	Fluoro-scopy
KH12	42,663,382	5,190,642	2,726,563	9,876,838	624,581	22,910,375	1,334,383
DID	40,598,640	5,405,404	2,727,652	8,463,979	444,936	22,519,368	1,037,301
Ratio	1.05	0.96	1.00	1.17	1.40	1.02	1.29

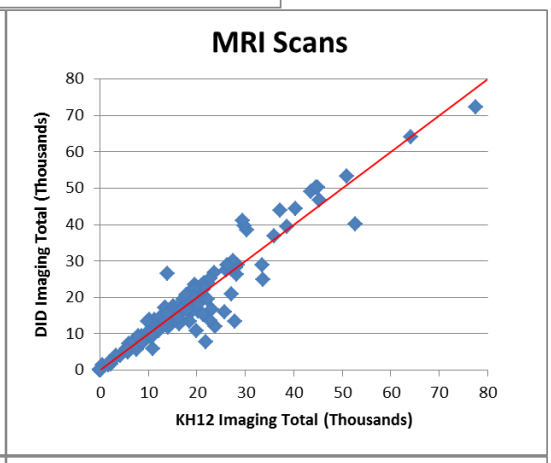
Note: A ratio of less than 1 indicates DID is higher, a ratio of greater than 1 indicates KH12 is higher

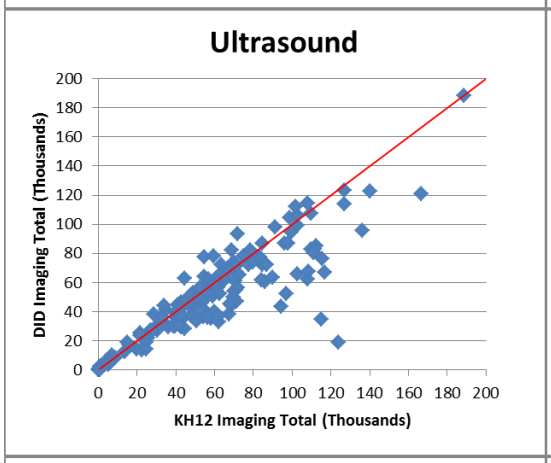
Most of the trusts in this comparison have KH12 to DID ratios grouped around 1.0. However the spread of ratios varies by modality and there are a few outliers, as seen in Graph 1.

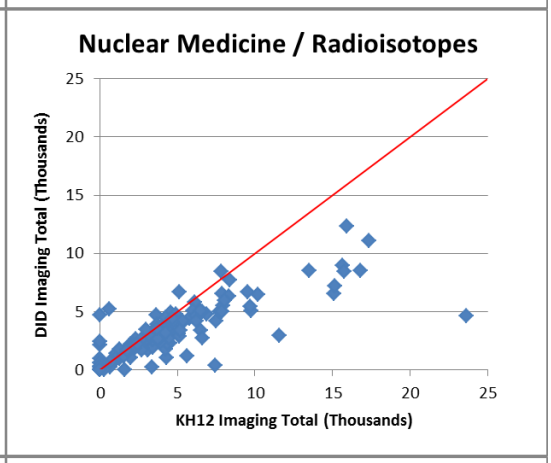
Graph 1. Trust scatter graph for KH12 imaging totals vs DID imaging totals

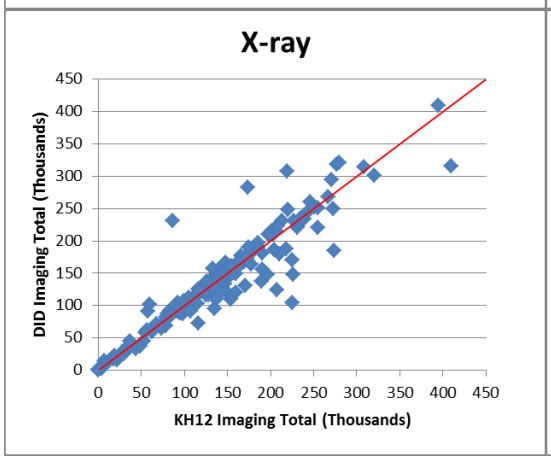


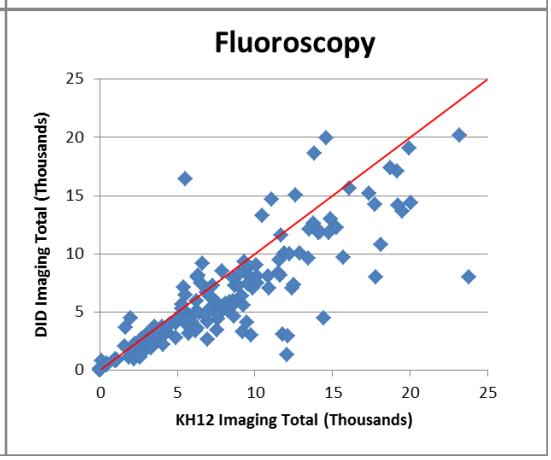












For the sum of all modalities, 63% of trusts have a ratio between 0.9 and 1.1, although KH12 is higher in 61% of trusts. The modality with the highest proportion of trusts with a ratio between 0.9 and 1.1 was X-ray (69%) whilst Fluoroscopy had the lowest (18%). A full breakdown by modality can be seen in Table 3.

Table 3. Summary of trust KH12-DID ratios distribution, by modality

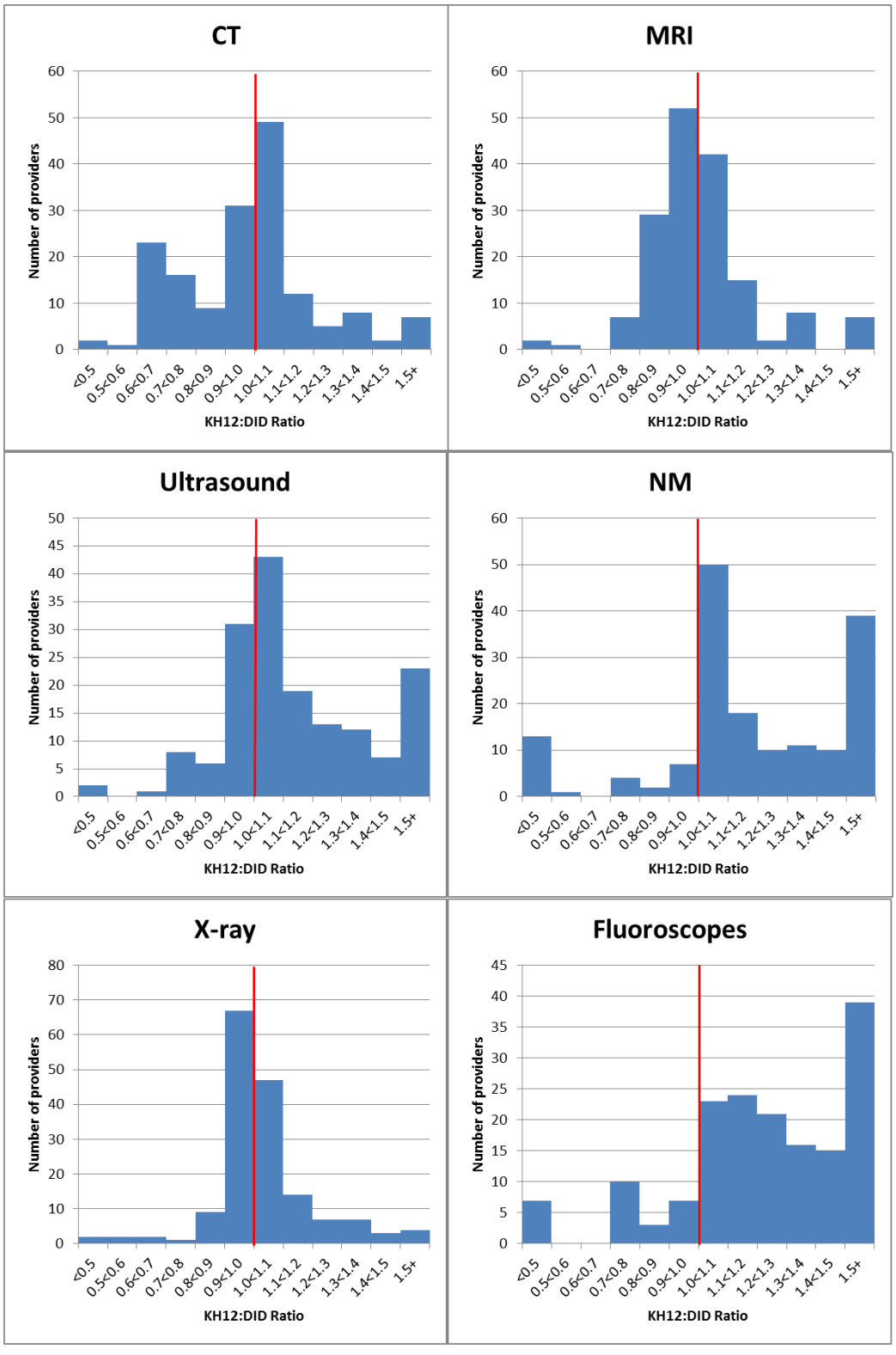
	All modalities	CT Scans	MRI	Ultrasound	Nuclear Medicine / Radioisotopes	X-ray	Fluoro-scopy
Ratio 0.9 – 1.1	63%	48%	57%	45%	35%	69%	18%
DID Higher	39%	50%	55%	29%	16%	50%	16%
KH12 Higher	61%	50%	45%	71%	84%	50%	84%

The distribution of providers by KH12:DID ratio for each modality is given in Graph 2[7]. X-ray has the closest trust level comparison with most ratios close to 1, a balanced distribution and minimal outliers. Conversely Nuclear Medicine / Radioisotopes and Fluoroscopy had far fewer trusts with a difference under 10% and far more outliers. There could be several reasons why these two modalities have a particularly poor comparison between collections, but it seems likely that definitional differences affect what constitutes Nuclear medicine or Fluoroscopy in each case. The DID defines these by a set of SNOMED-CT and NICIP codes, whereas KH12 cites IMAGING MODALITY from the NHS Data dictionary, which offers no further definitional information. So possibly activity reported in other modalities in the DID, such as PET and SPECT scans, might be included here in KH12.

It was already thought that obstetric ultrasound may be under reported on DID and this could help to explain the significant difference in ultrasound between the two collections. However, further investigation with selected Trusts would be required to confirm this.

[7] This updates Graph 1 from the DID 2013/14 Technical Report, which was based on unadjusted DID activity.

Graph 2. Distribution of KH12:DID ratios, by modality.



Note: A ratio of less than 1 (red line) indicates DID is higher

3.2 Comparing DM01 and DID

There is a much larger difference between DM01 and DID activity for CT and MRI scans than there is for KH12 and DID. At England level DID is 23% higher for CT Scans and 11% higher for MRI Scans (see Table 4).

Table 4. Number of imaging tests by collection and comparison ratio, 2013/14

	CT Scans	MRI
DM01	4,286,892	2,658,236
DID	5,535,861	2,999,601
Ratio	0.77	0.89

Note: A ratio of less than 1 indicates DID is higher, a ratio of greater than 1 indicates DM01 is higher

By only looking at the 161 trusts that are present in both collections, the numbers reduce slightly in both modalities but the ratios remain similar, as seen in Table 5.

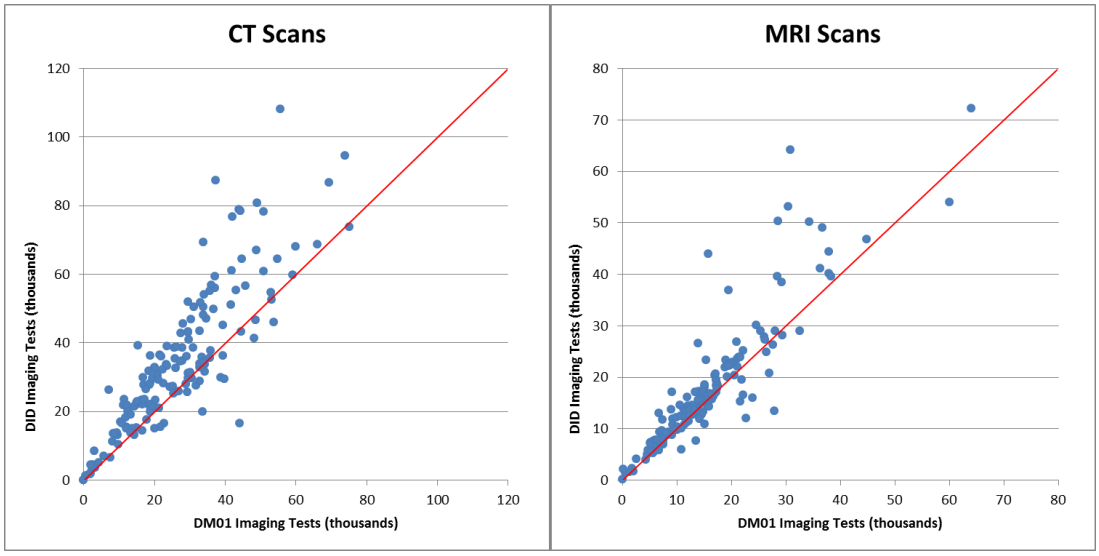
Table 5. Number of imaging tests by collection and comparison ratio, 2013/14 (161 trusts for comparison)

	CT Scans	MRI
DM01	4,263,238	2,494,689
DID	5,475,294	2,794,936
Ratio	0.78	0.89

Note: A ratio of less than 1 indicates DID is higher, a ratio of greater than 1 indicates DM01 is higher

The correlation between DM01 and DID at a trust level for CT and MRI is fairly weak, as shown in Graph 3. The ratios are more dispersed from 1.0 (red line on Graph 3), especially for the larger providers, and there are several outliers.

Graph 3. Scatter graph for DM01 imaging tests vs DID imaging tests, by modality



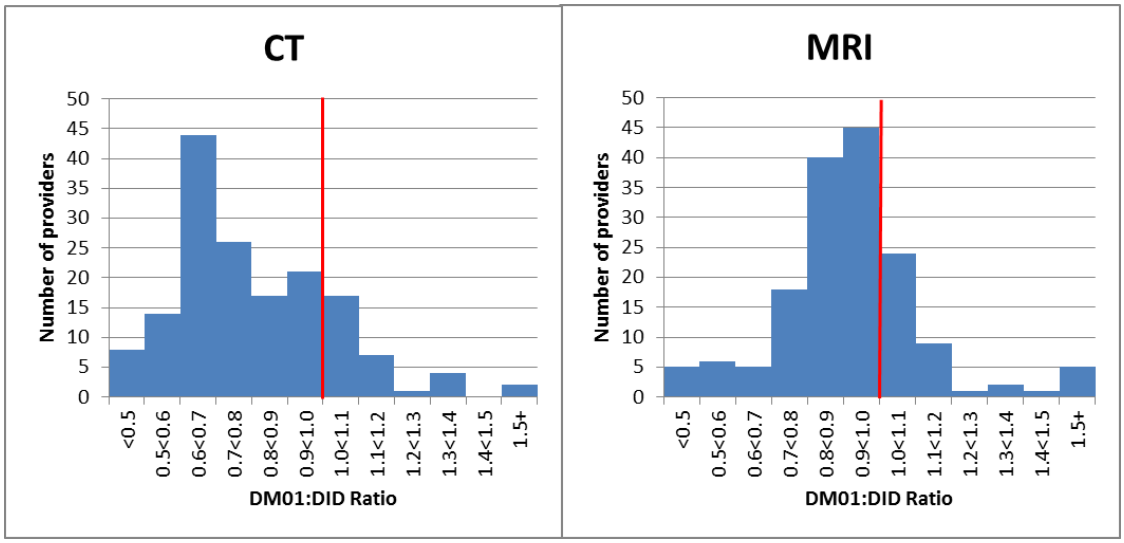
For CT, only 23% of trusts had a DM01:DID ratio of between 0.9 and 1.1 and DID was higher for 79% of trusts. For MRI, 42% trusts had a DM01:DID ratio of between 0.9 and 1.1 and DID was higher for 72% of trusts, see Table 6.

Table 6. Summary of trust DM01-DID ratios distribution, by modality

	CT Scans	MRI
Ratio 0.9 – 1.1	23%	42%
DID Higher	79%	72%
DM01 Higher	21%	28%

The distribution of providers by DM01:DID ratio for both modalities can be seen in Graph 4[8]. Both modalities show a skew towards lower values indicating that most trusts report higher DID values than DM01.

Graph 4. Distribution of DM01-DID ratios, by modality.



This comparison between DM01 and DID using adjusted DID data inflates the DID above DM01, even though the comparison with unadjusted DID data was closer (nationally, +13% instead of -23% for CT and +2% instead of -11% for MRI). This may suggest that the DM01 counts cases rather than individual tests. Alternatively it suggests shortfalls in the DM01 activity reporting - perhaps particularly affecting non-waiting list activity since, although included, this is not relevant to the waiting list part of the return. Within DM01, 63% of reported CT activity and 84% of reported MRI activity was tests on a waiting list and there were several large NHS Trusts reporting no emergency or planned / surveillance activity when it would be expected that they should.

[8] This updates Graph 2 from the DID 2013/14 Technical Report, which implied a much closer correlation based on unadjusted DID activity.

4 Conclusion

Overall KH12 and DID match well, with KH12 2% higher than DID for comparable modalities (5% when matched providers are used). This suggests that using a body multiplication factor minimises the reporting differences between the two collections. Certain modalities show a better match than others, with X-ray showing the closest comparison and Nuclear Medicine the most difference.

The DM01 and adjusted DID has a much poorer comparison, both at England level and at trust level. CT is 23% higher in DID and MRI is 11% higher, with only 23% of trusts for CT and 41% for MRI having a DM01 total within 10% of the DID total This may be partly due to unnecessary use of the body site multiplier adjustment on DID, but seems likely to be more the result of under-reporting of certain types of activity on DM01, notably planned and unscheduled activity.

5 Annex

5.1 Comparison of original and multiplier adjusted DID data.

Table 7. Original and Adjusted DID

	Total	X-ray	Ultrasound	CT	MRI	Fluoroscopy	NM
Original	37,843,530	21,832,985	8,140,175	3,780,405	2,614,865	1,028,735	446,365
Modified	42,088,849	23,215,049	8,805,410	5,535,861	2,999,601	1,076,375	456,553
Multiplier Ratio	1.11	1.06	1.08	1.46	1.15	1.05	1.02

5.2 Contact Us

5.2.1 Feedback

We welcome feedback on this publication. Please contact us at did@dh.gsi.gov.uk

5.2.2 Websites

The DID website can be found here: http://www.hscic.gov.uk/DID

The DID Tables and Reports can be found here:
http://www.england.nhs.uk/statistics/diagnostic-imaging-dataset/

5.2.3 Additional Information

For press enquiries contact the NHS England Media team on 0113 825 0958 or 0113 825 0959. Email enquiries should be directed to nhsengland.media@nhs.net

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