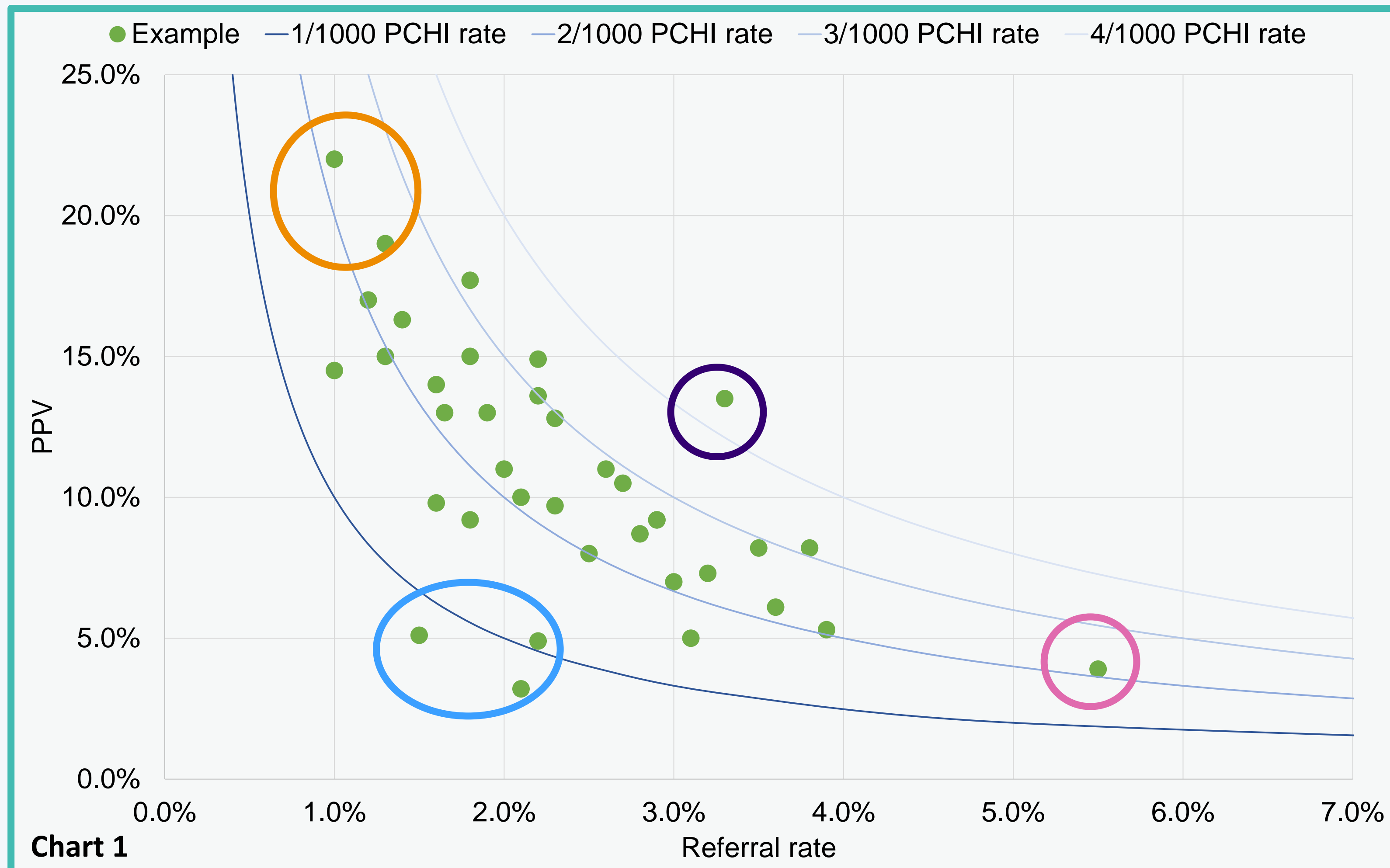


Using data from the NHS Newborn Hearing Screening Programme national IT system to inform screening & audiology quality improvement initiatives

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Introduction

Data from the NHS Newborn Hearing Screening Programme (NHSP) national IT system *Smart4Hearing* (S4H) allows screening providers and NHS England to monitor the activity and performance of screening provision across England. NHSP guidance states that records in S4H for all babies with confirmed Permanent Childhood Hearing Impairment (PCHI) should be updated until their fifth birthday. This allows the NHS to monitor the effectiveness of screening in identification of the targeted condition.



These providers seem to have a higher PPV while maintaining an expected rate of detection of PCHI

These providers seem to have a low rate of PCHI in the population compared to their peers.

This provider has a higher rate of PCHI detection than their peers.

This provider has a higher referral rate than their peers, but the rate of detection of PCHI is not much different.

1. Positive Predictive Value

There is a mathematical relationship between Positive Predictive Value (PPV), referral rate from the screen and the identified rate of the outcome in the tested population. The equation that links these 3 measures is:

$$\text{Rate of the condition} = \text{Referral rate} \times \text{PPV}$$

This relationship allows for comparison between providers where the number of tests, the number referred and the number of confirmed cases of the condition are recorded. It is possible to plot onto a chart of PPV and screen referral rate a line showing what a specific rate of the condition would be at any point. When service level PPV and referral rates are added to this base plot, variations along each 'rate of condition line' become visible and can be explored.

3. Application of the technique in NHSP

We applied this methodology to data for babies immediately referred from NHSP. Data was extracted from S4H for a 3-year period to determine if there were sites with unusual patterns of referral rate, PPV and/or rate of PCHI. This data is plotted on **Chart 2**.

Initial observations suggested that there were sites where babies referred to audiology had a lower PCHI yield than expected. By adding lines showing the national PCHI detection rate, ± 1 or 2 standard deviations, we observed a group of sites that were below the expected range of rates of detection.

4. Findings

Where differences between services are observed, these could be reviewed to identify areas of good practice or where improvements are required. Differences may be due to recording or data management issues or, where referral thresholds fell outside agreed guidance; inexperienced screening staff, highlighting training needs, lack of quality assurance or unfamiliarity with screening equipment. Equally the difference may represent more worrying issues such as inequalities in access, ineffective diagnostic services, or environmental factors affecting the rate of a condition in the population. The analysis cannot identify these problems. However, it can assist in identifying outliers who can then be investigated further to assure the quality of the service for babies who refer from the newborn hearing screen.

Subsequent work has been completed with these outlier sites which has informed a national review into paediatric audiology.

2. Example & Assumptions

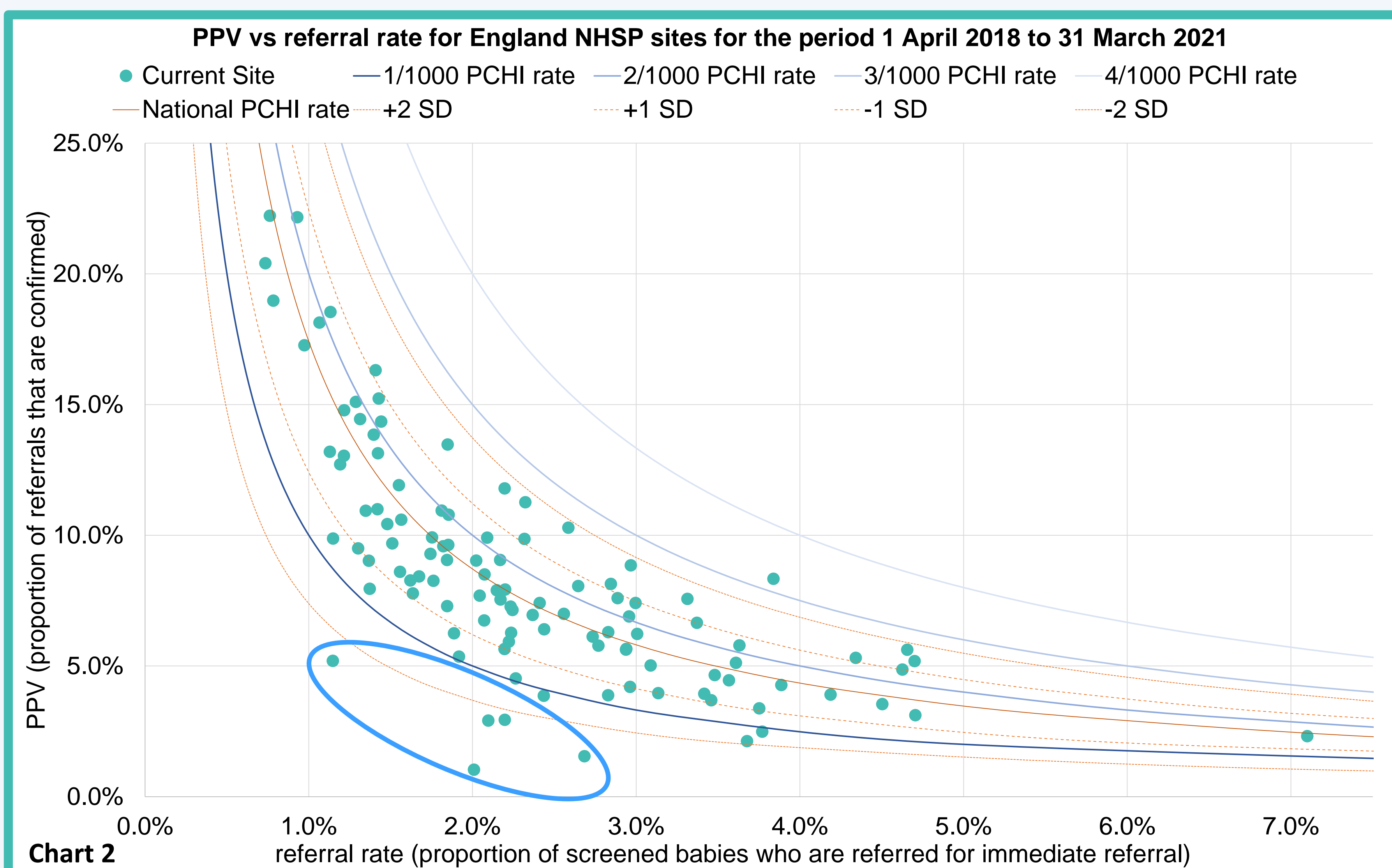
Chart 1 shows example data for this type of chart, and how providing all 3 measures on the chart can allow differences between service providers to be put into additional context.

So that the variations of the data using this visualisation can be compared the following assumptions are made:

- data records for the numbers tested, referred, and identified with the condition are complete in the system
- the distribution of the rates of the condition across sites is normal

This technique cannot identify the causes of variation, but it can highlight where differences exist in the S4H system that warrant further investigation

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