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Southend Borough Council

11th April 2019

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Predictive Analytics: The Data tells the story

Moving from the use of data as a tool for measuring what we have done in the past, to a tool for identifying where we should be working in the future.

Operational Performance & Intelligence

Before we start…

slido.com

#P022

Ask questions at any time via this link – or just shout!

Operational Performance & Intelligence Team

Who are we?

Supported the Bid

Identified the local need

Helped determine outcomes

Track outcomes data

Report on outputs

Inform service design

What is Predictive Analytics?

“Predictive analytics is the practice of extracting information from existing data sets in order to determine patterns and predict future outcomes and trends.”

Is this the same as forecasting?

Examples of forecasting / predictive analytics in everyday life?

Common Examples of Predictive Analytics

- Credit Scoring
  - Models use customers' credit history, loan applications and personal data to asses probability of them making future payments on time
- Customer Retention
  - Analysing customers' past service usage / spending, to determine the likelihood of a customer leaving soon – can then provide lucrative offers to stay
- Cross-Selling
  - For companies selling multiple products, they can analyse customers' spending, usage and other behaviour, to determine what additional products customers may want to purchase

Anything not to do with making money?

- Google Flu Trends
  - Provided estimates of flu activity for 25+ countries by aggregating Google Search queries
- Social Care Re-referrals
  - A government department tested whether computer analysis of social care case notes might identify children that will be re-referred after the case is closed.
  - Analysing text from just 6% of all cases, they detected almost half of cases that will return
- Risk of future offending
  - Durham police are using artificial intelligence to predict the risk of future offending in order to inform bail applications – 98% accuracy for low risk-cases.

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Case study: Data saves lives - Asthma

Any Concerns?

Concerns

- Ethics
  - Aggregating data on citizens/families from different datasets could be intrusive – has consent been gained?
- Accuracy
  - Models are always less complex than reality.
- Inequality
  - Certain factors could be singled out and skew results

How does predictive analytics work?

Collect data from websites, surveys, statutory collections, credit cards

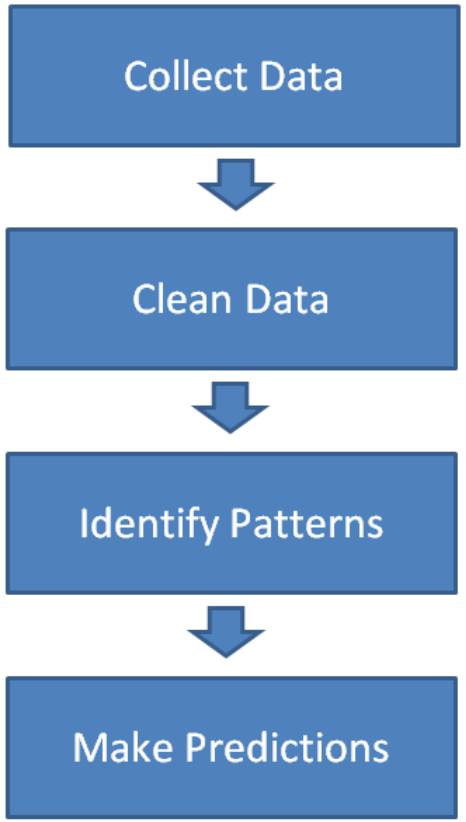
Clean the data by removing outliers

Are variables within the data related?

Correlation

If variables are related we can potentially predict one variable from another

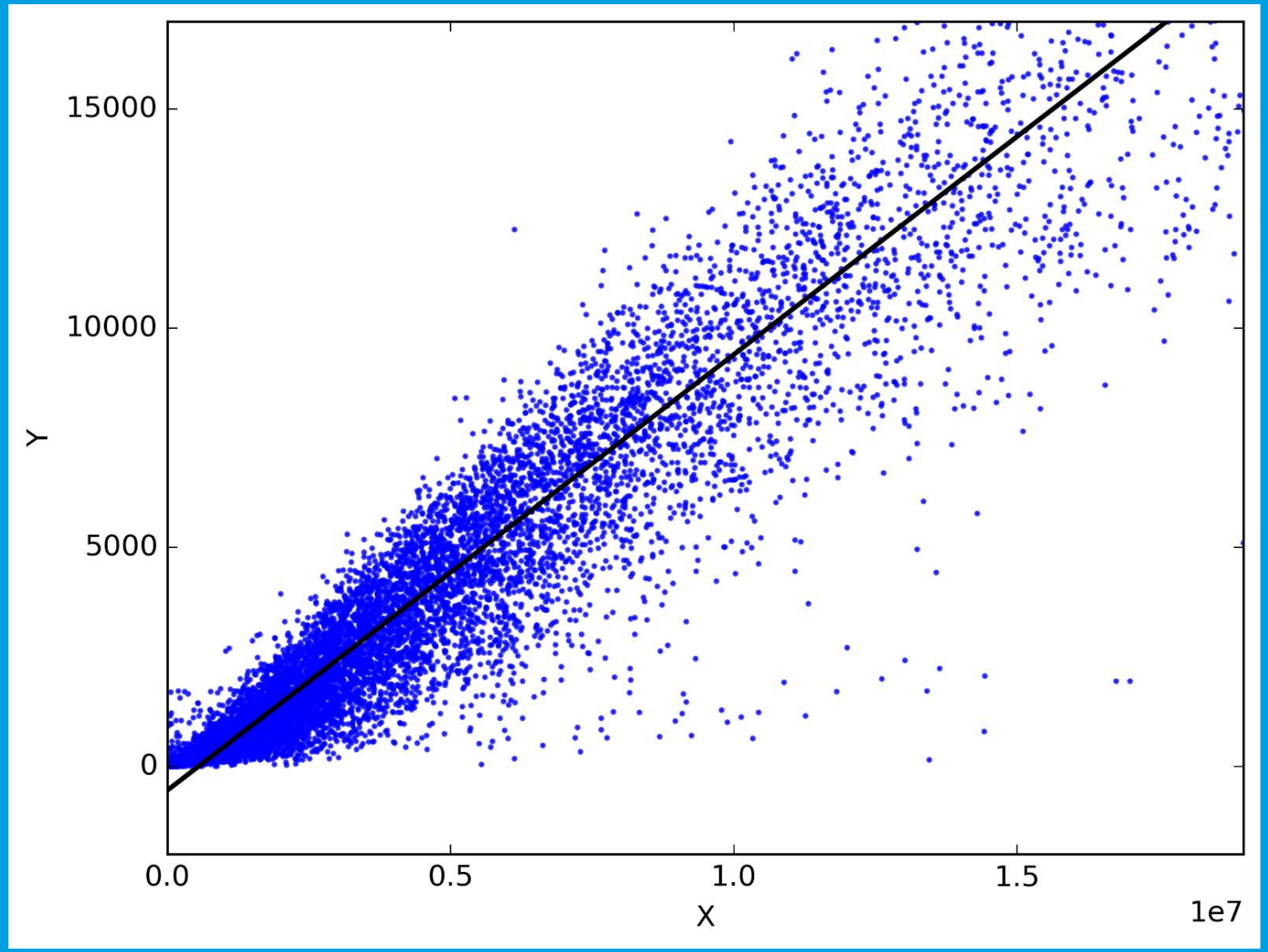
Regression



Correlation & Regression

- Correlation
  - Is there are relationship between 2 or more variables?
  - We can calculate the strength and direction of this relationship
    - Positively related
    - Negatively related
    - No relationship

- Linear Regression
  - If there is a relationship we can:
    - Predict an outcome variable from one predictor variable
    - Predict an outcome from several predictor variables

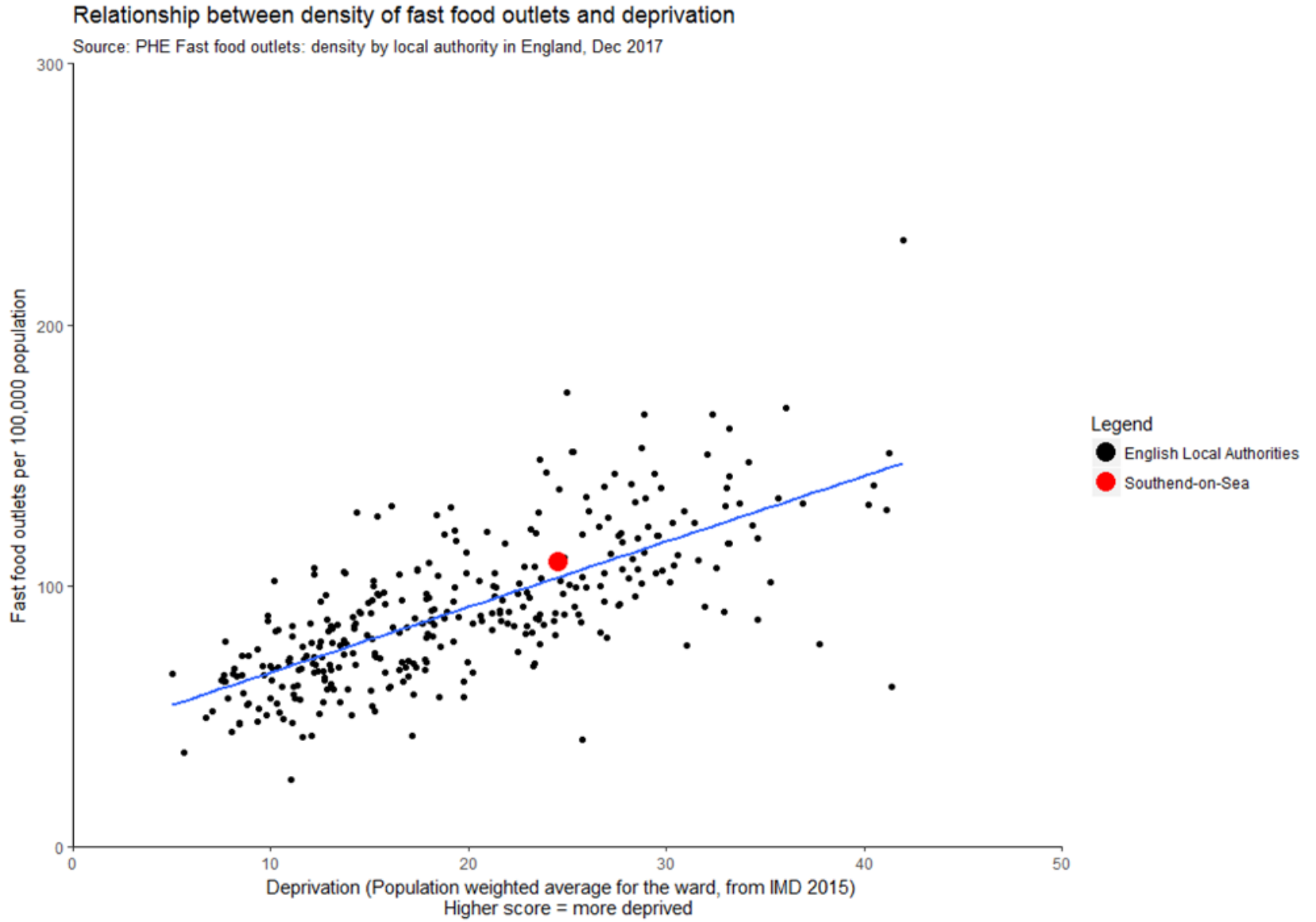


$$Y_i=(b_0+b_1X_i)+e_i$$

Linear Regression Model

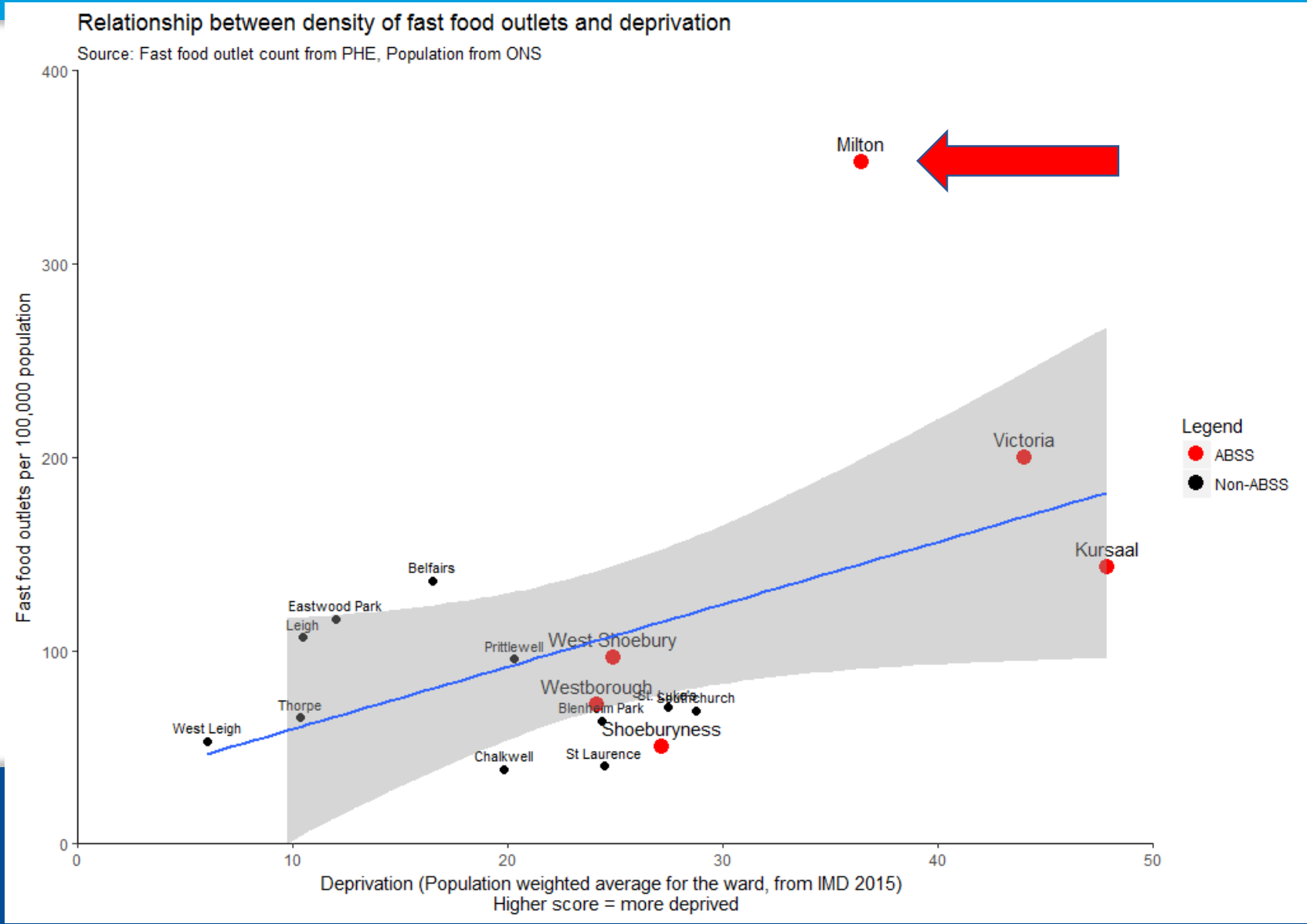
Correlation quiz

- Public Health England: Relationship between density of fast food outlets and deprivation
- What is the relationship between these variables?
  - Positive
  - Negative
  - No relationship

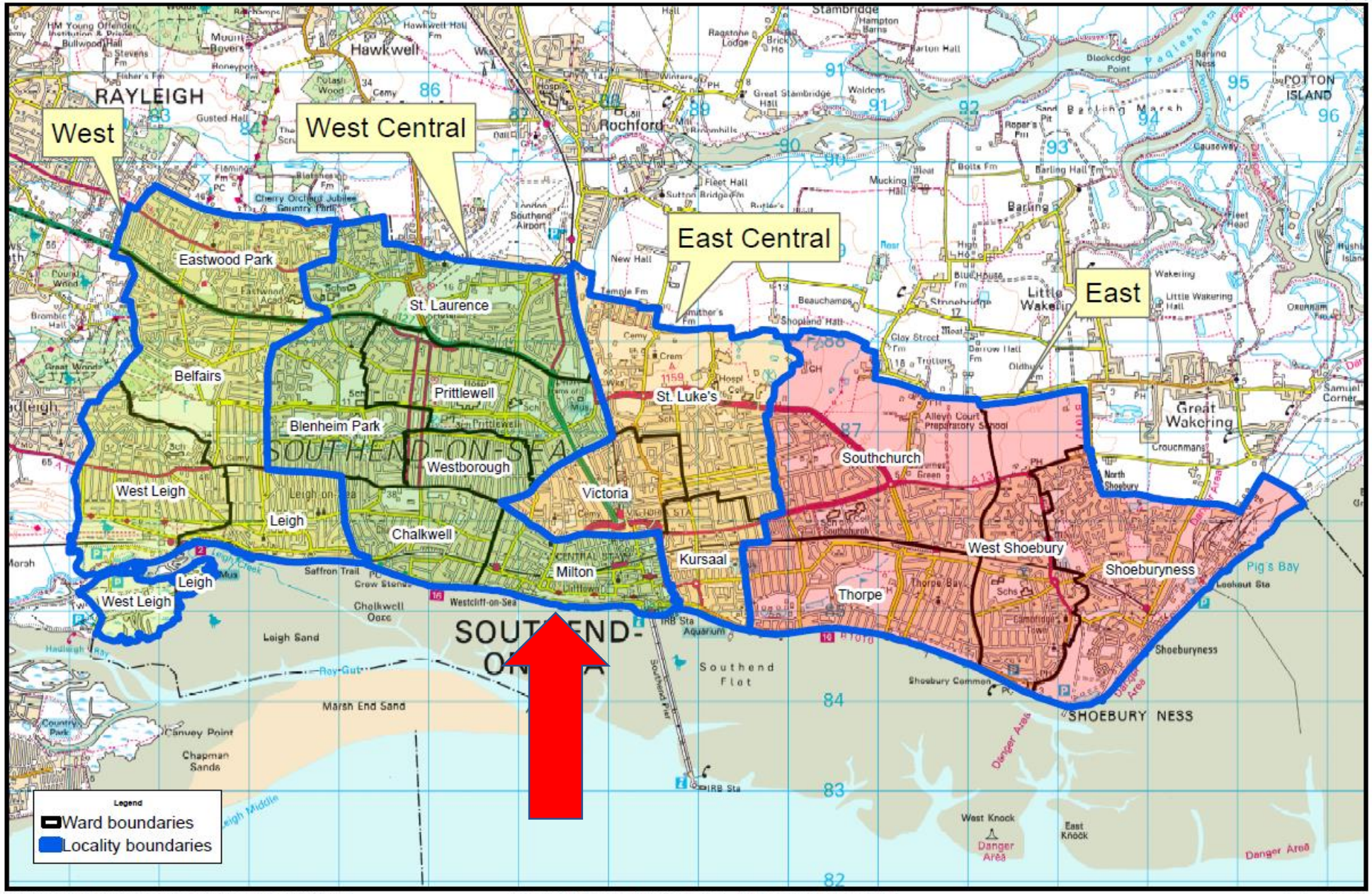


Correlation quiz

- How might we describe the data for Milton ward?
- Any ideas why this is the case?



Southend-on-Sea
Locality and Ward boundaries

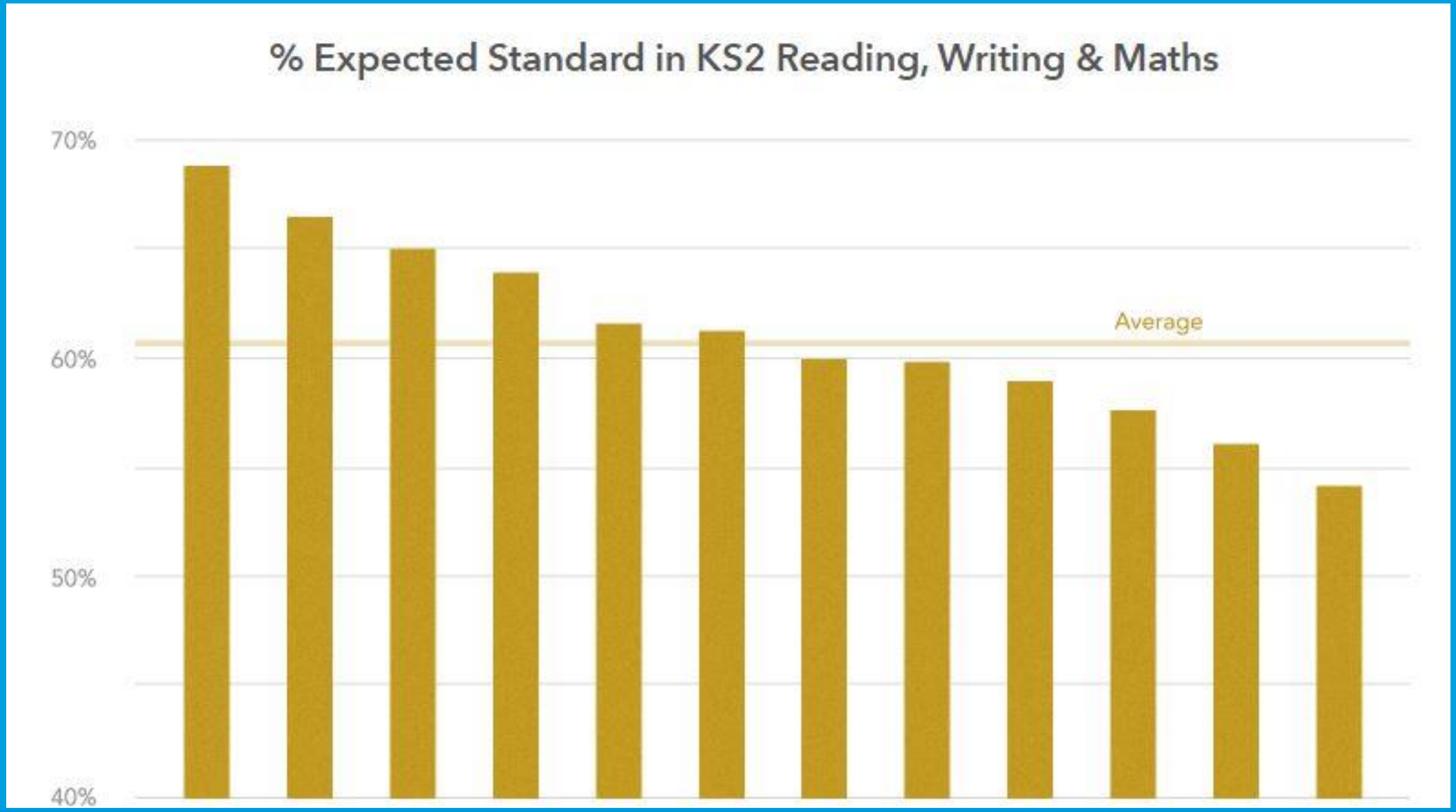


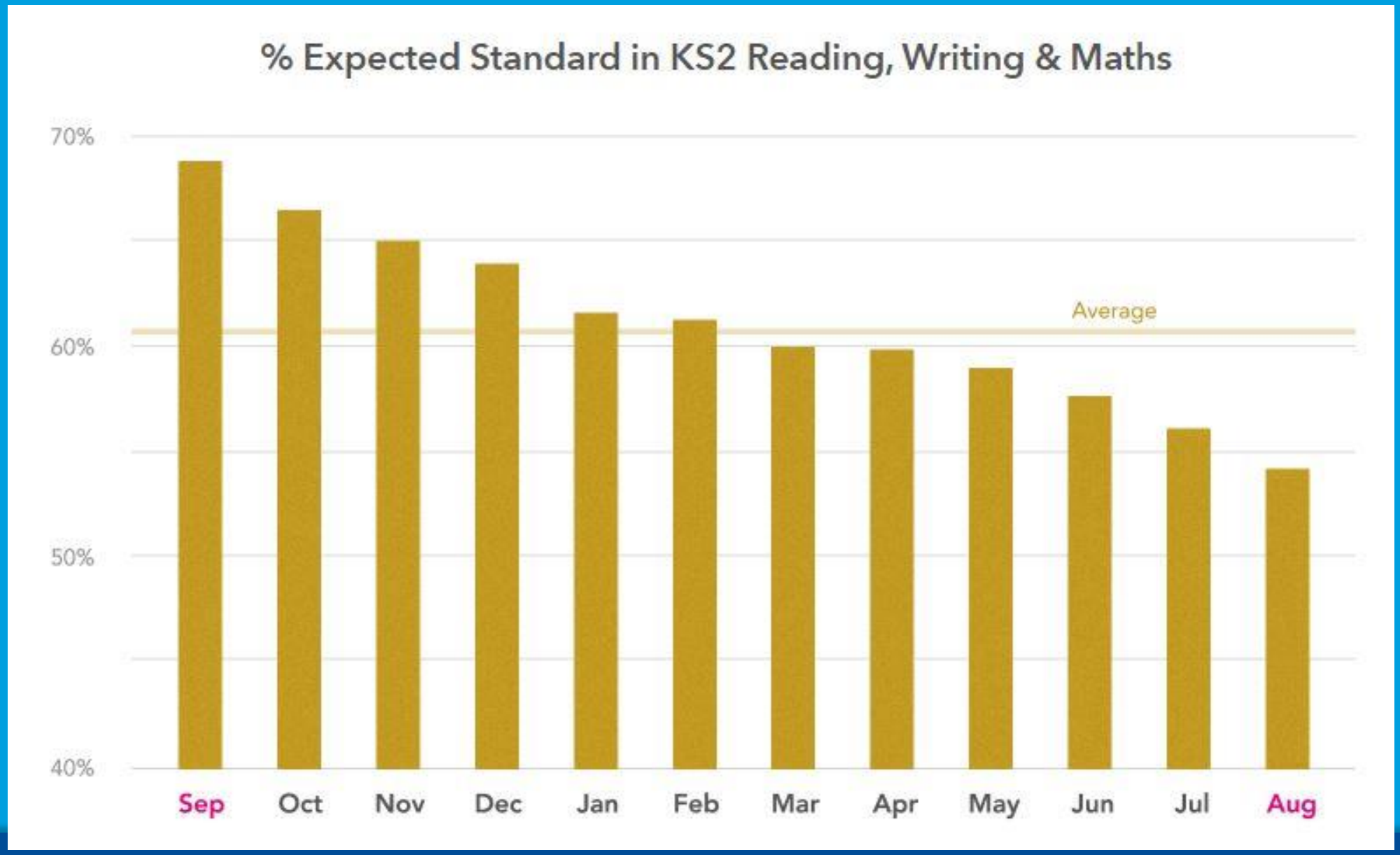
Operational Performance & Intelligence Team – Southend-on-Sea Borough Council

Scale 1:55,194

Any Questions?

How might these techniques be used in Southend?


% Expected Standard in KS2 Reading, Writing & Maths
70%
60%
50%
40%
Average



What other factors might affect pupil attainment?

How we use predictive analytics

- Estimating pupils' attainment outcomes to assist target setting

FFT Aspire Value Added Model

= Pupil Benchmark Grade

Concerns

- Ethics
  - Aggregating data on citizens/families from different datasets could be intrusive – has consent been gained?
- Accuracy
  - Models are always less complex than reality.
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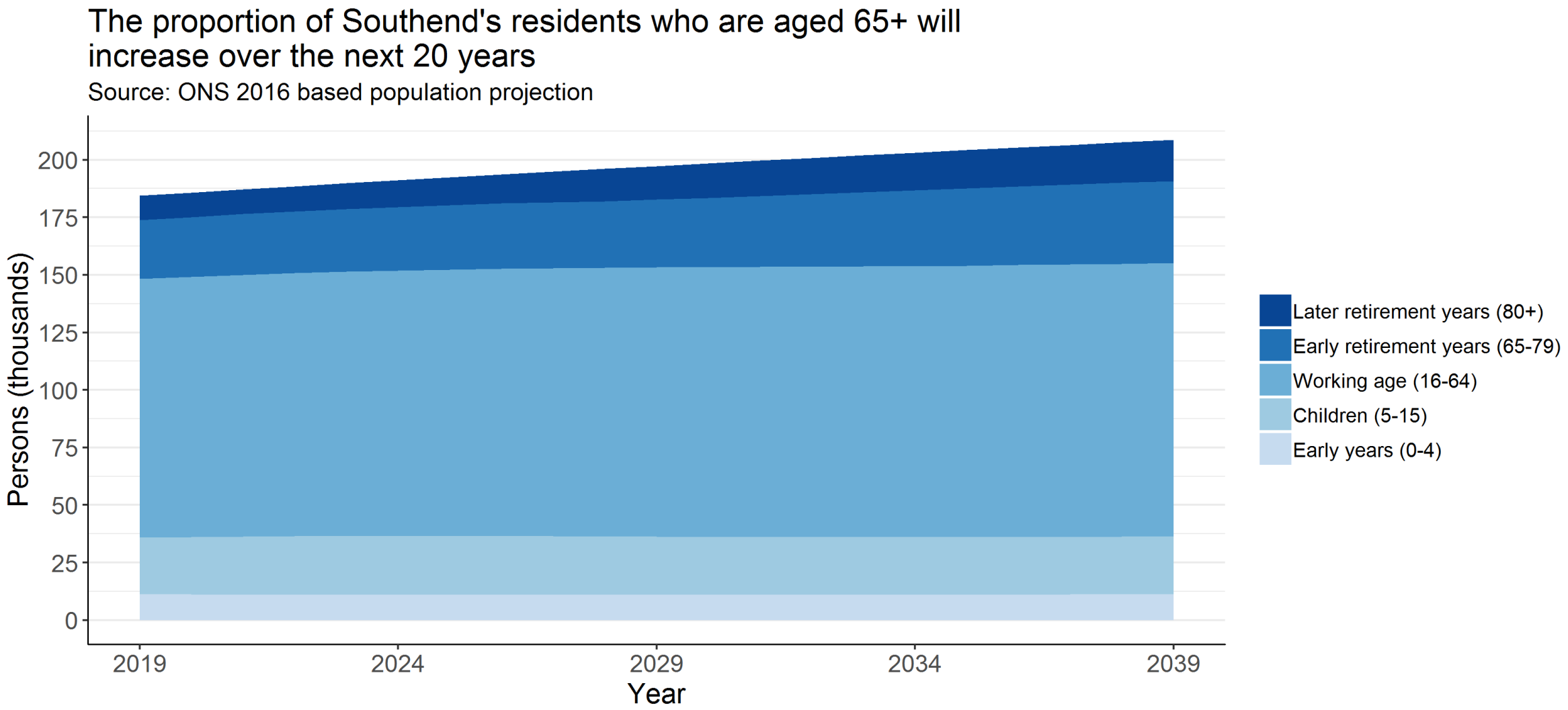
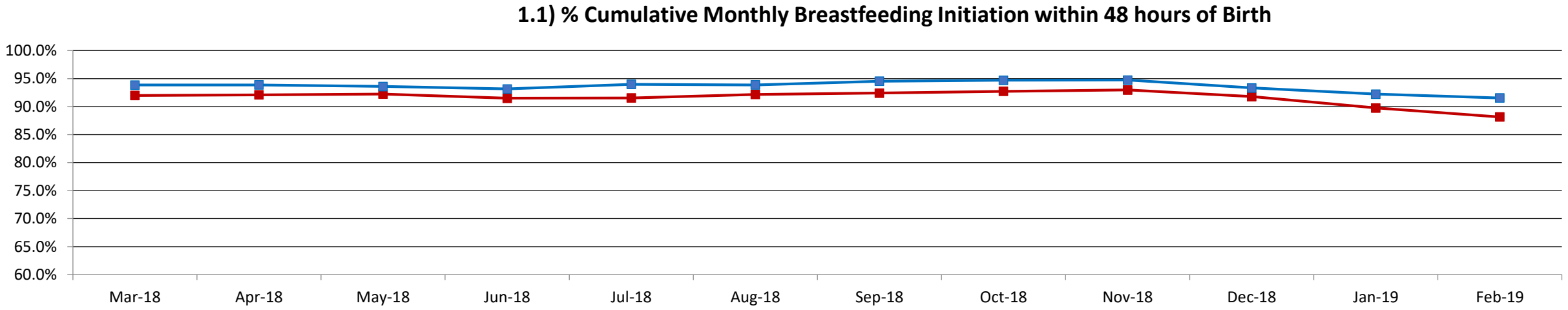
How we use predictive analytics

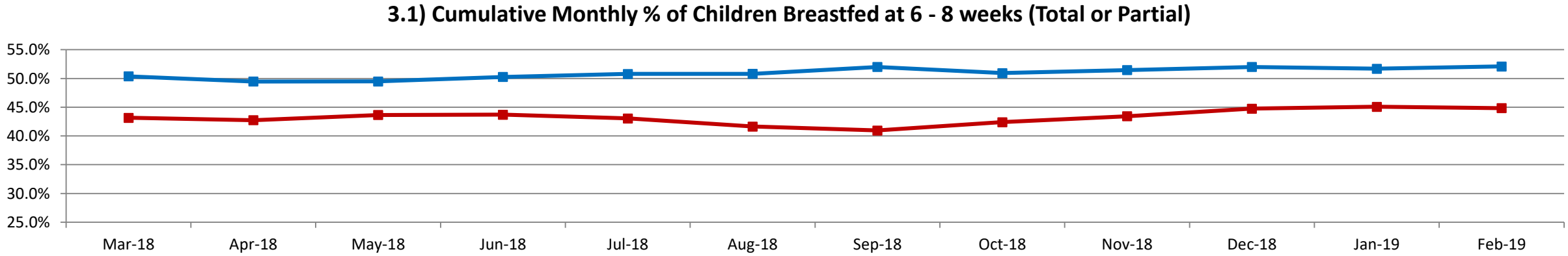
- Estimating the probability of a student not being in employment, education or training to ensure appropriate support is offered
  - By analysing the characteristics of past pupils who struggled to find a place in education, employment or training we can identify ‘at-risk’ pupils and which schools have high numbers
  - Share information with personal advisers so that they can prioritise where to offer support
  - Developing more robust ‘machine-learning’ method using data mining and probability statistics

How we use forecasting



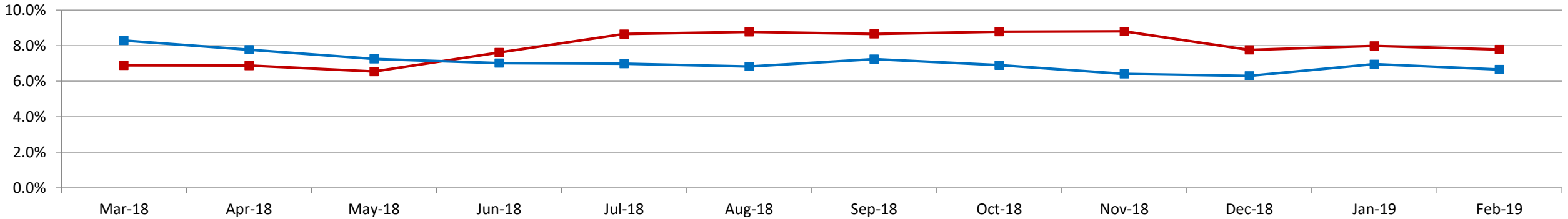
How we use forecasting



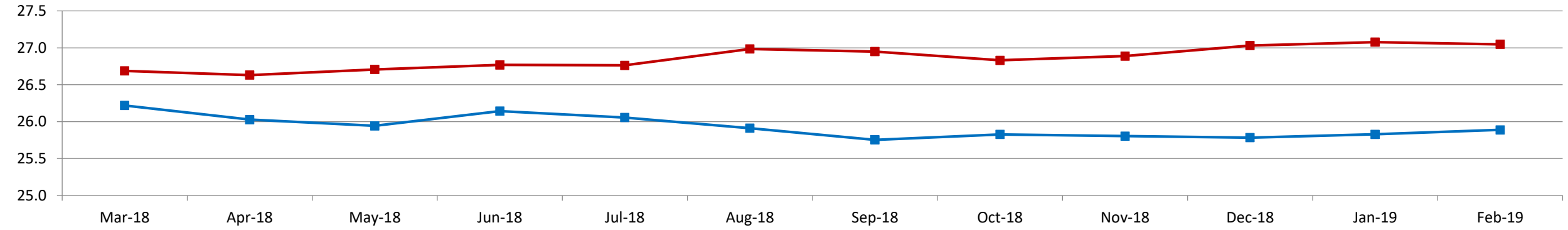


How we use forecasting

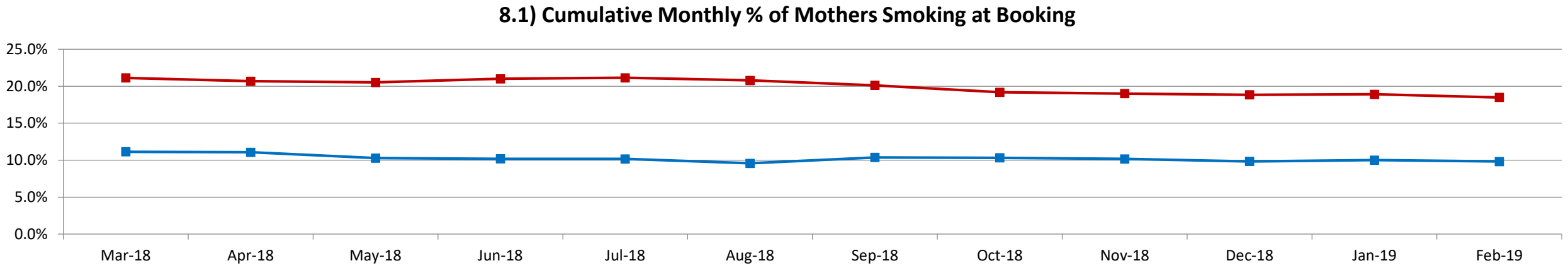
4.1) Cumulative Monthly % of Low Weight Births (<2.5Kg all babies)

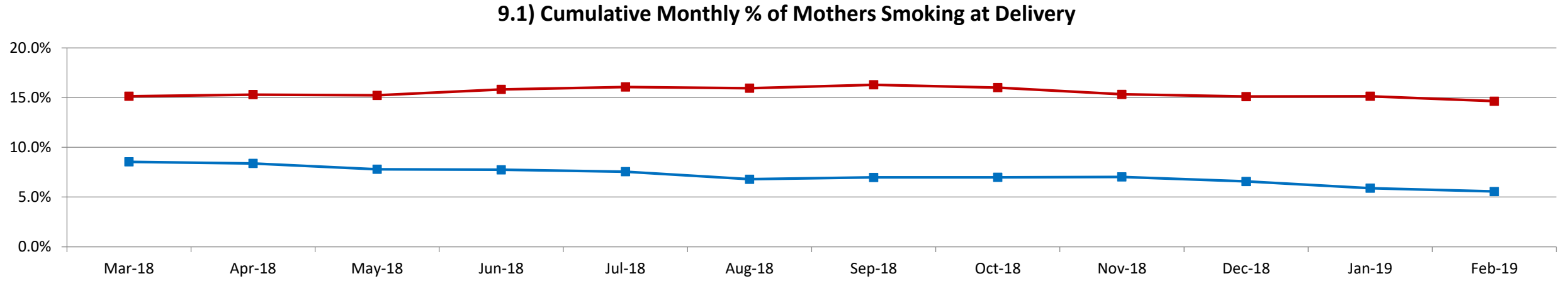


6.1) Cumulative Monthly Average BMI of Mothers at at Booking



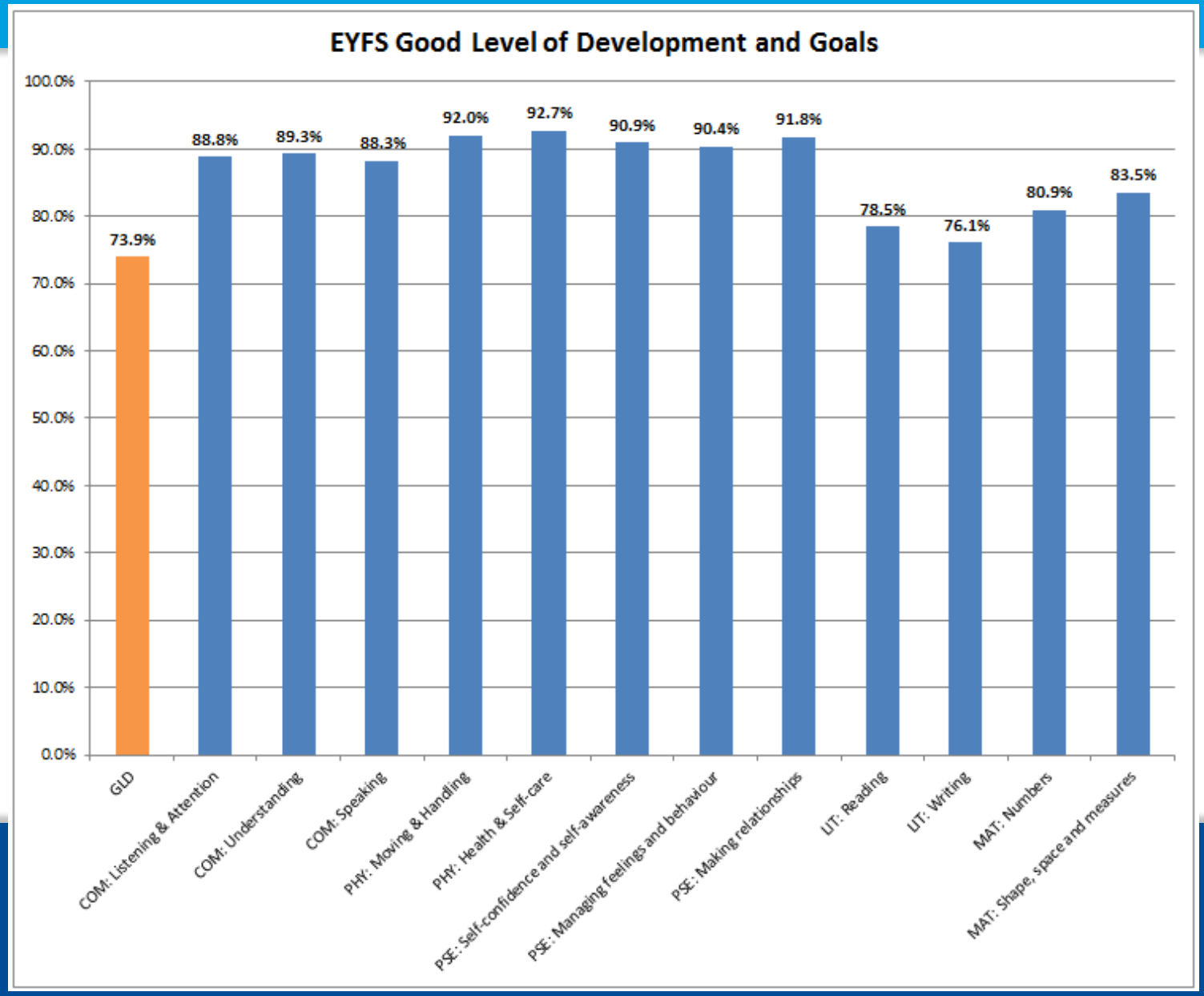
How we use forecasting





How we use forecasting

- Analyse outcomes for pupils in Early Years Foundation Stage Profile
- How might we improve the number of children achieving a Good Level of Development (GLD)?
- Identified which learning goals were standing out as a barrier to achieving GLD
- Examined characteristics of pupils not achieving GLD



Year	ABSS	Total in GLD areas	Ward
2016	N	0	Belfairs
2017	Out	1	Blenheim Park
2018	Y	2	Chalkwell
(blank)	(blank)	3	Eastwood Park
		4	Kursaal
		5	Leigh
		6	Milton
		7	Prittlewell
		8	Shoeburyness
		9	Southchurch
		10	St Laurence
		11	St. Luke's
		12	Thorpe
		(blank)	Victoria
			West Leigh
			West Shoebury
			Westborough
			(blank)

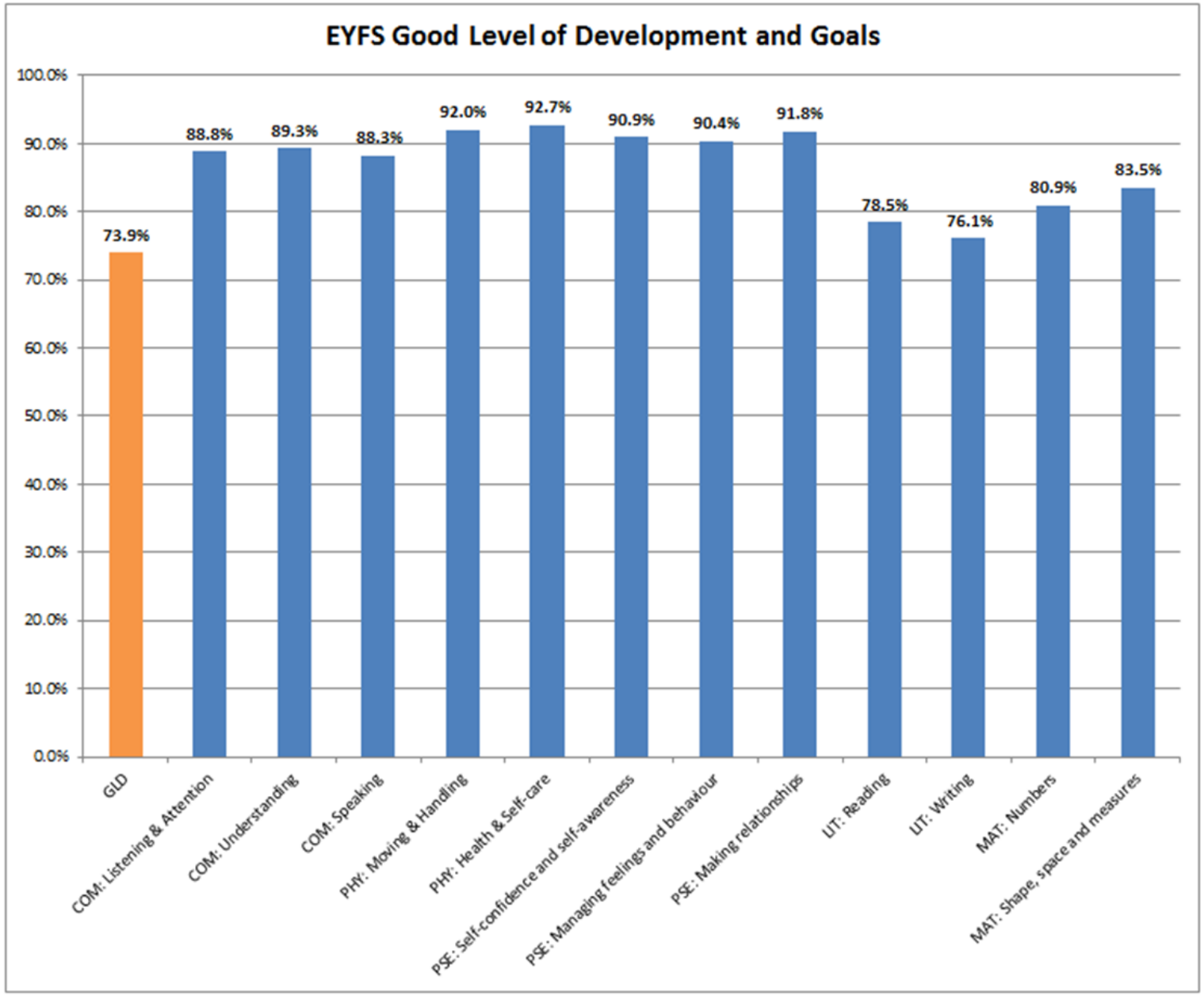
Deprivation
0-10%
11-20%
21-30%
30%+
(blank)

SEN	EAL
E	N
K	Y
N	(blank)
S	
(blank)	

Term Of Birth
Autumn
Spring
Summer
(blank)

Gender
Female
Male
(blank)

Disadvantaged
No
Yes
(blank)



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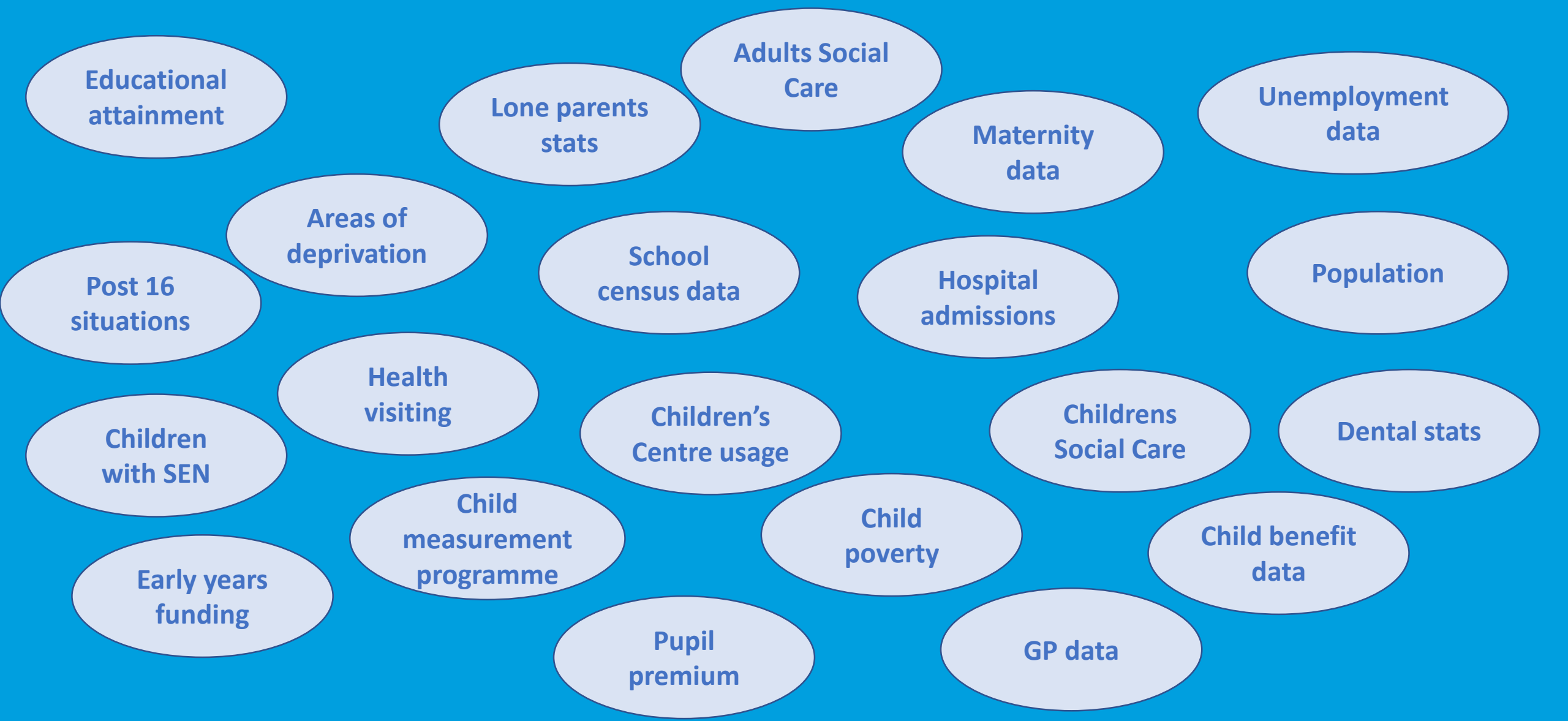
2176 Children represented

How we use predictive analytics

- Preventonomics
  - Focus on the economics of prevention activities
  - Estimate potential savings from preventative interventions
    - Pull together existing evidence on costs associated with childhood problems in economic model
    - Gives us an estimate of the cost of not intervening
    - Then look at interventions which can prevent these problems and calculate potential savings


Educational attainment
Adults Social Care
Lone parents stats
Maternity data
Unemployment data
Areas of deprivation
School census data
Post 16 situations
Hospital admissions
Population
Health visiting
Children's Centre usage
Childrens Social Care
Dental stats
Children with SEN
Child measurement programme
Child poverty
Child benefit data
Early years funding
Pupil premium
GP data

What other information could we use to help with service design?

Any Questions?

The End

Thank You!

Please complete the rating poll

Contact Us

- data@southend.gov.uk
- abssresearch@pre-school.org.uk

Better Start Southend
our children
our community
our future

Thank you

We want Southend-on-Sea to be the best place in this country to bring up a child and be a parent