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Research and analysis

Main findings: How childcare could be optimised across local areas

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Applies to England

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Introduction

This study is the third part in our series on childcare accessibility. You can also read the last two:

- [Childcare accessibility by neighbourhood](#) – published with the Office for National Statistics
- [Changes in access to childcare in England](#)

In this piece, we look at how the issue of inaccessible childcare across England could be addressed.

We know that a lack of accessible and reliable childcare makes it difficult for parents, particularly mothers, to return to work after having children. A [survey of parents by the Department for Education](#) (DfE) found that if parents have access to childcare, they are more likely to enter the labour market.

Our [previous work](#) has shown that access to childcare is not evenly spread across the country. Families in advantaged, affluent areas tend to have better access to childcare, and more choice, than those in poorer areas.

This raises a question: how can we use evidence to help local authorities and central government better target new childcare provision in areas with low access?

This issue is particularly relevant, given the [upcoming roll-out of 30 government-funded hours of childcare](#) for families with children under 3 from September 2025. As the demand for childcare grows, the government will have to identify where additional capacity may be needed.

Although it is not Ofsted's duty to make sure there is enough childcare at a local level, our Early Years Register gives us comprehensive information on the amount of childcare available and where it is located. We want to share this information to help decision-makers improve access to childcare across the country.

In this analysis, we explore how decision-makers can use 'optimisation modelling' to understand and reduce disparities in access to childcare. Optimisation modelling is a method to find the best solution out of all the possible ones. Our optimisation model simulates a redistribution of childcare. It looks at how, if we could move childcare settings around freely, we could rearrange them to improve accessibility, particularly for those who need it most.

Of course, in practice, nurseries and other childcare providers cannot simply relocate from one area to another. The model is therefore not a blueprint for direct action, but a strategic model that:

- shows the mismatch between where childcare is currently available and where it is most needed

- identifies priority areas where lack of provision may be most acutely limiting parents' choices and opportunities
- helps policymakers see what more equitable access could look like, guiding investment and planning

! This analysis only includes childcare places registered with Ofsted. Around 300,000 places (19%) are school-based and are not included in this analysis.

The method

We have taken a 2-step approach to (hypothetically) planning new childcare provision to achieve equal accessibility across England.

Our method is based on the work of Xiang Li and others, who proposed a 2-step approach to planning new facilities to achieve equal accessibility.[\[footnote 1\]](#) Their findings showed that placing new facilities (or childcare) in the right locations does more to mitigate unfair access than just increasing the capacity of existing settings.

This approach first uses a genetic algorithm (an algorithm that mimics natural selection to evolve to an optimal solution) to find the best locations to place new childcare facilities. It then uses quadratic programming (a way of solving optimisation problems involving quadratic functions) to determine how many places each childcare setting should ideally have.

We are not really moving or creating childcare places. We have used a model to explore how existing places could be arranged differently to improve access for families in areas that currently have fewer options. The places are recorded in our Early Years Register, which includes childcare provided by nurseries and childminders.

See our [methodology document](#) for detailed information on the genetic algorithm and quadratic programming that we used.

Figure 1: Method for optimising accessibility to childcare

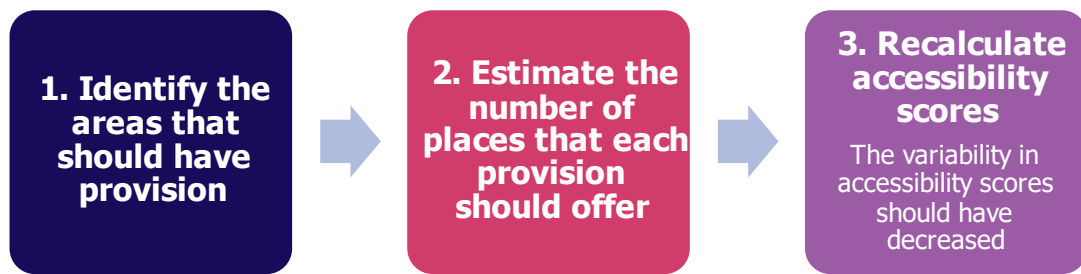


Figure 1 is a flow chart showing the method used for optimising accessibility to childcare. In the first step we identify the areas that should have provision. Second, we estimate the number of places that each provision should offer. Finally, we recalculate the accessibility scores, and should find that the variability in accessibility scores has decreased.

Calculating the optimal number of childcare places at the output area level for the whole of England needs a lot of computing resources – specifically, time and processing power – to complete. Therefore, to illustrate our method, we focused on 2 case studies rather than producing results for the whole country. We chose Lincolnshire, and an area combining Sandwell and Walsall. Expanding this analysis to cover the whole of England is an important next step for future work.

We cannot compare the accessibility scores here with those in our previous publication. These case studies focus on specific local authorities, so we cannot account for families crossing local authority borders to access childcare provision. They may travel from outside our selected local authority to use a setting within it, or vice versa. Therefore, we have reproduced scores only considering Lincolnshire, and Sandwell and Walsall combined. You can read more about this in our [methodology document](#).

Our analysis was carried out at output area level. The [ONS explains](#) that, as of 2021, an output area typically contains 40 to 250 households, and an average of 28 children aged 7 and under.

We have aggregated to the level of lower-layer super output area (LSOA) in the presentation of our results unless otherwise stated.

Case study 1: Lincolnshire

Our first case study looks at Lincolnshire, a local authority with a mix of rural and

urban areas. Lincolnshire has higher-than-average childcare accessibility and a high variability in childcare accessibility. A high variability means that there is a large gap in the level of access to childcare depending on where someone lives. In some areas, there might be lots of childcare options nearby, while in other areas, there might be very few or none at all.

Following optimisation, the variation in accessibility across Lincolnshire decreased by 56%, with an average accessibility score of 27 places per 100 children.

Fifty-two per cent of LSOAs in Lincolnshire had improved accessibility: a gain of more than 1 place per 100 children. This affects approximately 43,000 households with dependent children aged 0 to 15 years old, as at [Census 2021](#).

Figure 2: Current places compared to optimised places in Lincolnshire – 31 December 2024

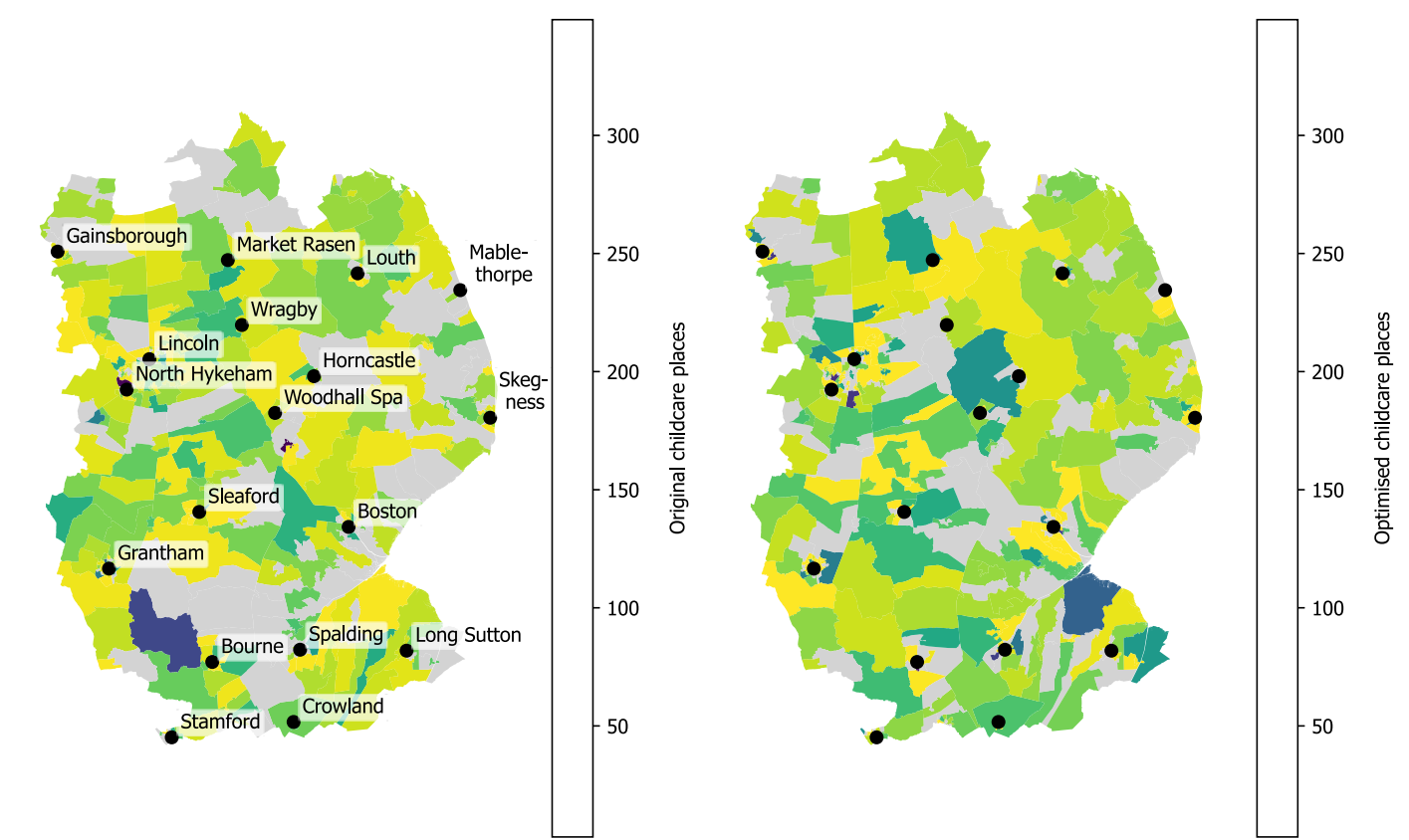


Figure 2 is a map showing areas of Lincolnshire shaded from yellow to dark blue to represent childcare places before and after optimisation, with dark blue indicating areas with more childcare places. Place names are labelled in black. Key towns like Lincoln, Boston and Grantham are marked.

Table 1: Wards in Lincolnshire with the greatest increase in places

Ward	Increase in places
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Glebe	427
Fenside	385
Bourne Austerby	258
Park	235
Holbeach Hurn	235

Figure 3: Current childcare accessibility scores compared to optimised childcare accessibility scores in Lincolnshire – 31 December 2024

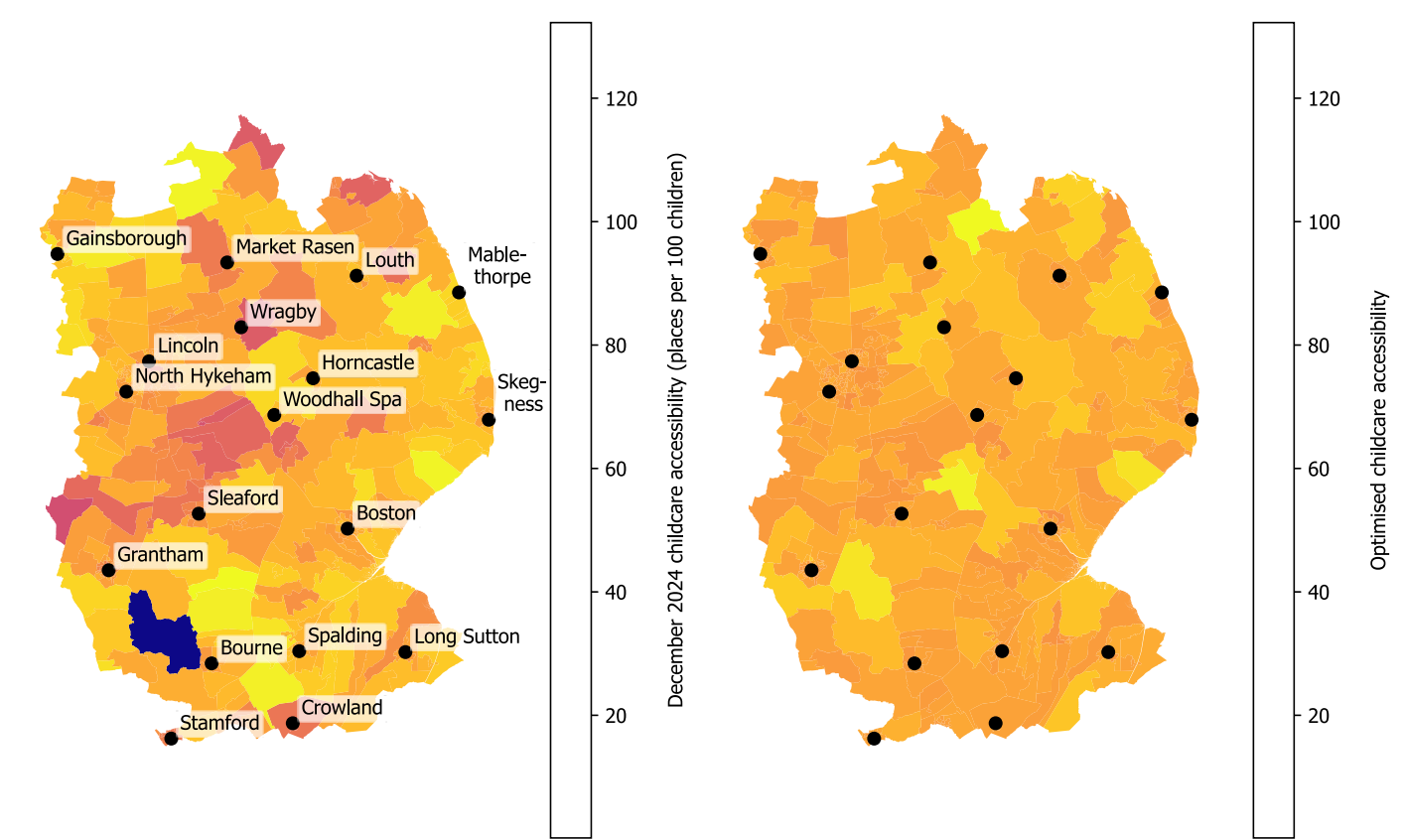


Figure 3 is a map showing areas of Lincolnshire shaded from yellow to dark purple to represent childcare accessibility scores before and after optimisation, with dark purple indicating areas with greater access to childcare. Place names are labelled in black. Key towns like Lincoln, Boston and Grantham are marked.

Case study 2: Sandwell and Walsall

The second case study focuses on Sandwell and Walsall combined, 2 neighbouring urban local authorities in the West Midlands. Both rank among the bottom 10 for

overall childcare accessibility in England, yet they also exhibit low variability in accessibility. This made them ideal test cases for our method, and will allow us to assess whether we can further reduce variability in local authorities that already have relatively consistent access to childcare.

Following optimisation, we have been able to reduce the variation in accessibility by 61%, with an average of 15 accessible places per 100 children.

Thirty-one per cent of LSOAs in Sandwell and Walsall had improved accessibility, a gain of more than 1 accessible place per 100 children. This affects approximately 26,000 households that have dependent children as at Census 2021.

Figure 4: Current places compared to optimised places in Sandwell and Walsall – 31 December 2024

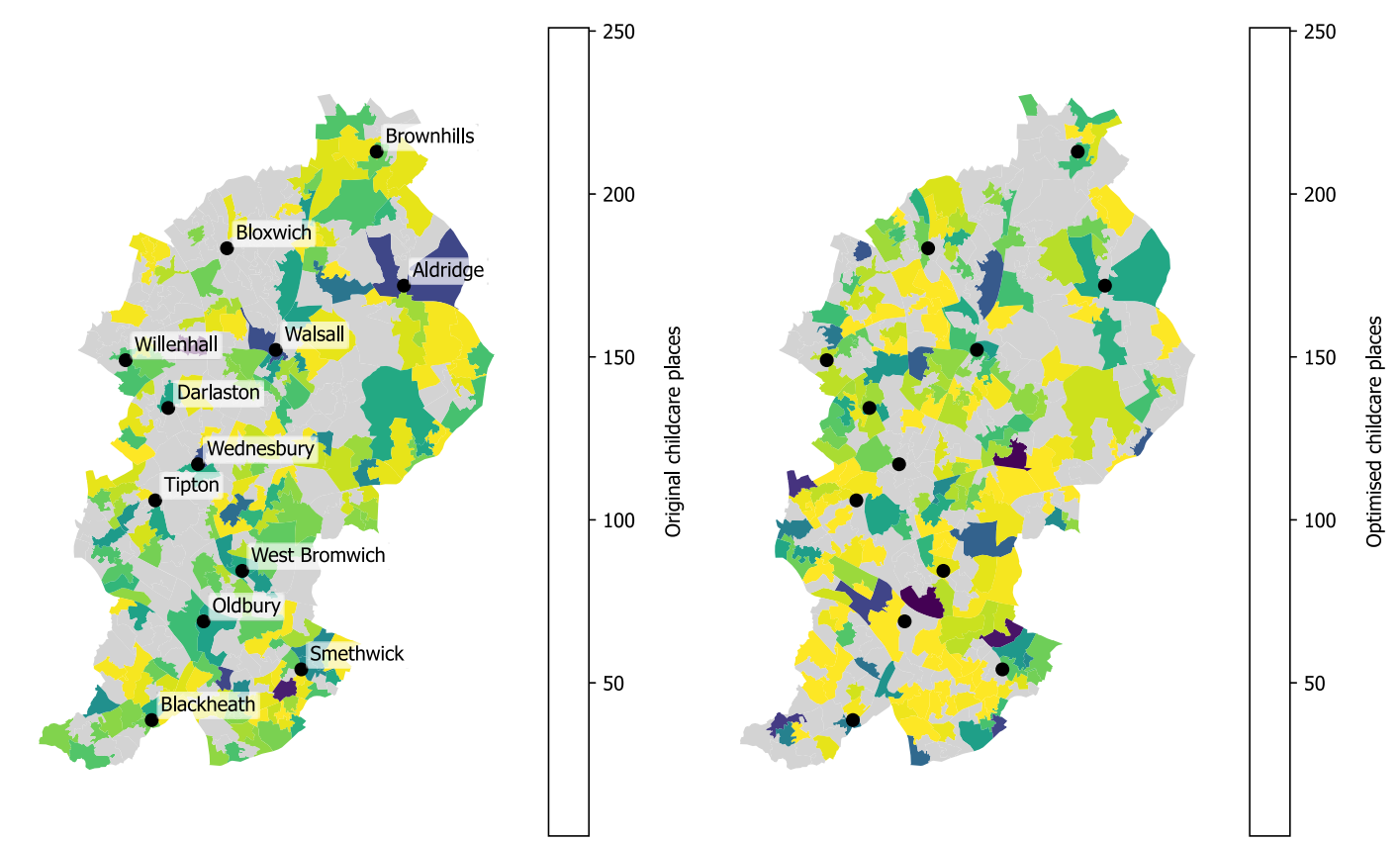


Figure 4 is a map showing areas of Sandwell and Walsall shaded from yellow to dark blue to represent childcare places before and after optimisation, with dark blue indicating areas with more childcare places. Place names are labelled in black. Key towns like Walsall, Smethwick and West Bromwich are marked.

Table 2: Wards in Sandwell and Walsall with the greatest increase in places

Ward	Increase in places
Pleck	294

Bloxwich West	276
Darlaston South	248
Blakenall	243
Abbey	239

Figure 5: Current childcare accessibility scores compared to optimised childcare accessibility scores in Sandwell and Walsall – 31 December 2024

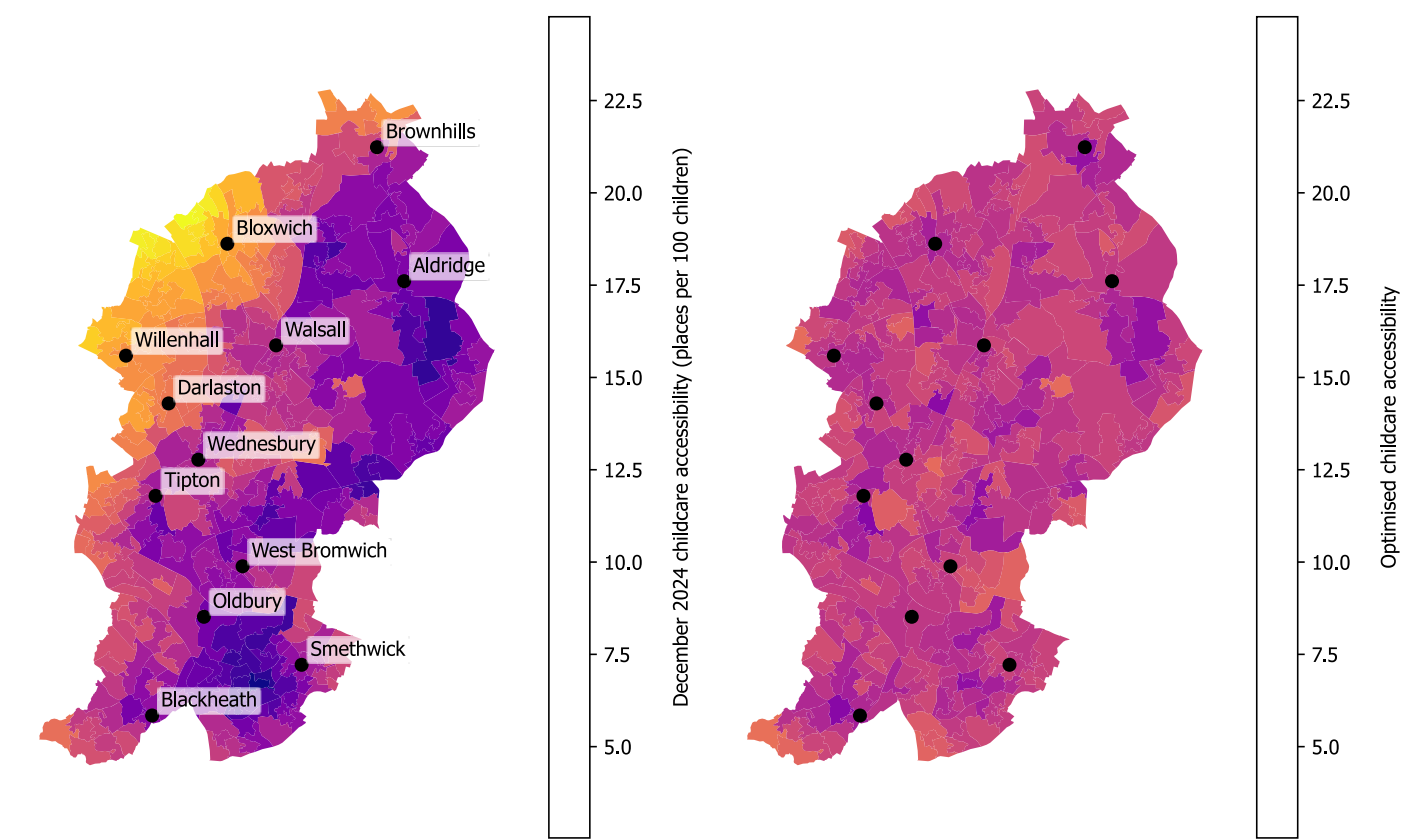


Figure 5 is a map showing areas of Sandwell and Walsall shaded from yellow to dark purple to represent childcare accessibility scores before and after optimisation, with dark purple indicating areas with greater access to childcare. Place names are labelled in black. Key towns like Walsall, Smethwick and West Bromwich are marked.

Which areas are most affected?

To understand how changes in childcare accessibility vary across different areas, we explored a range of socioeconomic factors. Our analysis looks at which

communities or areas are most likely to see improvements in childcare accessibility with the model in place, and whether patterns emerge based on deprivation, income levels and maternal education. You can find further details in the methodology.

In both case studies, we have found that the following areas are significantly more likely to see an increase in access to childcare:

- areas where higher proportions of children aged 0 to 15 live in [income-deprived families](#)
- areas where lower proportions of women in households with dependent children aged 0 to 4 years have higher education qualifications
- wards where higher proportions of the LSOAs are in the bottom 10% in England, based on the proportion of children aged 0 to 15 living in income-deprived families

Future work

We have chosen to focus on minimising the variance in accessibility of childcare provision in England. However, there are other objectives that we could look at to improve childcare accessibility.

One approach could involve targeting specific areas where certain demographic factors suggest a higher need for childcare. For example, we could look at regions where women have higher qualifications, but employment is low. This could help address a potential gap in labour-market participation. This approach would require adding extra rules to the model to focus on these areas or doing research to find out which locations would benefit the most from more childcare provision. Targeted interventions could help make sure that the availability of childcare aligns with areas of greatest socioeconomic need.

Conclusion

Research from the Institute for Fiscal Studies (IFS) and the DfE shows a strong link between accessible childcare and parents being in employment, particularly mothers. For example, an [IFS study](#) found that expanding free childcare from part time to full time significantly increased how many mothers were working. Similarly,

the DfE's [Childcare and Early Years Survey](#) showed that just under half (48%) of non-working mothers said that if they could arrange good quality childcare that was convenient, reliable and affordable, they would prefer to go out to work.

By redistributing existing childcare provision more equitably, our model improves accessibility for just under 69,000 households with dependent children across our case studies. This suggests that such an approach has the potential not only to reduce inequalities in access but also to support broader economic and policy objectives by facilitating greater workforce participation among parents.

We recognise the importance of government initiatives aimed at [expanding early years provision within schools](#). Currently our approach only considers childcare places in providers registered on Ofsted's Early Years Register (EYR); however, this approach can be expanded to include school places.

By identifying optimal locations for new childcare provision and working out their ideal capacity, we want to help policymakers achieve equal access to childcare across communities in England. Policymakers can use our model to make informed, evidence-based decisions about where to target investment in childcare provision.

By identifying areas with the lowest accessibility, which is often those with higher deprivation or where mothers have lower levels of qualifications, this model helps highlight where extra childcare is needed most. It can help local authorities and government with their strategic planning, by showing where provision can be rebalanced or expanded to meet increasing demand. This is particularly relevant considering the upcoming roll-out of 30 government-funded hours of childcare for families with children under 3.

However, running this analysis for the entire country presents significant computational and practical challenges. It is not only computationally intensive but also time-consuming. A more efficient approach will be needed to solve the problem.

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1. X Li, F Wang and H Yi, '[A two-step approach to planning new facilities towards equal accessibility](#)', in 'Environment and Planning B,' volume 44(6), 2016, pages 994 to 1011. ↩

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