Technical Appendix

This technical appendix provides details of the methods employed in the analysis presented in Section 2 of the report *Developing Children's Zones in England*. It covers the caveats associated with the data analysis, the data sets and selection criteria for the indicators used, and details of multiple regression analyses.

In the report, we looked at four specific indicators of disadvantage which are identified and measured separately, and reported at LSOA level. These were:

- **Health:** the percentage of adults in each LSOA who had reported their health as being 'good' in the past 12 months. A low score may indicate poor health.
- **Unemployment:** the combined percentage of males (aged between 18 and 64) and females (aged between 18 and 59) claiming Job Seeker's Allowance (JSA) in each LSOA.
- **Adult education:** the percentage of adults in each LSOA who had reported they had no qualifications.
- **Housing:** barriers to housing and services are recognised and measured separately within the Indices of Multiple Deprivation (IMD) on the basis of a number of indicators, including household overcrowding, homelessness and housing affordability.

1. Caveats in interpretation

To ensure the accurate interpretation of the data, we also noted (in addition to those covered in the report) these important caveats:

- The interpretation of the analysis is on the basis of the combination of chosen predictor variables in the inferential analysis. It is important to note that this analysis is intended to be broadly representative of the data it represents, and other published literature in this field, but is not considered an in-depth analysis or solely authoritative comment in regards to the specific areas that the variables represent. For instance, there are numerous and complex calculations behind recording some of the data, such as the multiple indices of deprivation, and similar data (or combinations of data) that have been calculated differently may yield different results.

- Although the above datasets can be fairly compared between different neighbourhoods because of their standardised nature, the time it takes to collate and publish this data means it is a retrospective analysis (up to 10 years for some data sets). There is no immediate measure of how the neighbourhoods might have changed in the interim period, making it difficult to link data on the different factors associated with poverty directly to academic attainments. Instead, the analysis makes suggestions as to the *likely relationships between factors.* There may be some other, more complex, factors at play that these datasets overlook.

- In order to create a representative dataset, it was important to consider whether there were any unusual or non-typical neighbourhoods. For instance, some individual neighbourhoods reported very low numbers of children (for example, less than 5). Basic statistical analysis showed an unusually high peak of neighbourhoods scoring 0 in educational attainment, with this being anomalous to the distribution of scores across the rest of England. For the purposes of the analysis, these neighbourhoods were removed. This means that while our analysis is not fully inclusive of national-level data, it still allows a reliable statistical model to be produced, and has the advantage of preventing unusual situations (such as a large cluster of retirement homes) affecting the national trends. Additionally, preliminary analysis showed little change in overall model fit and coefficient value between inclusion and removal of 0 scores; however the removal of the unusual cases allowed descriptive statistics such as minimum values and range to be interpreted more accurately.

2. Data sets and the selection of indicators

The table below gives details of data used in analysis.

Broad Category	Website	Database Name	Database Description	SOA Level
Housing	http://www.communities.gov.uk/publications/corporate/statistics/indices2010	Indices of deprivation 2010: Barriers to Housing and Services domain	This domain measures the physical and financial accessibility of housing and key local services. The indicators fall into two sub-domains: 'geographical barriers', which relate to the physical proximity of local services, and 'wider barriers' which includes issues relating to access to housing such as affordability.	LSOA
Health	Office for National Statistics	General Health (UV20) (2001)	This dataset is about General Health. It shows the usual resident population by a self-assessment of their general health over the 12 months before the Census.	LSOA MSOA
Employment	Office for National Statistics	Worklessness: Key Out of Work Benefits, January 2007 - December 2007	This dataset includes a selection of key figures related to the measurement of worklessness. The data is derived from a variety of sources including surveys, administrative sources and model-based estimates.	LSOA MSOA
Adult Education	Office for National Statistics	Qualifications (UV24) (2001)	This dataset is about Qualifications. It shows the usual resident population aged 16 to 74, by their highest level of qualification. The highest level of qualification variable was derived from responses in the 2001 Census to both the educational and vocational qualifications question, and the professional qualifications question.	LSOA MSOA
Deprevation	http://www.communities.gov.uk/corporate/researchandstatistics/publicdatasources/communitiesneighbourhoods/	The English Indices of Deprivation 2010	The English Indices of Deprivation measures relative levels of deprivation in 7 key domains: Income deprivation, Employment deprivation, Health deprivation, Disability, Education skills and Training deprivation, Barriers to housing and services deprivation, Living environment deprivation, and Crime. The scores from each domain are combined to give an overall score.	LSOA
Foundation Stage Results	Office for National Statistics	Early Years Foundation Stage Profile by Gender in England (Referenced by Location of Pupil Residence), 2010	This dataset provides information about the Early Years Foundation Stage Profile (EYFSP) results for pupils in all schools and early years' settings in England and who are resident in England. An overall breakdown by pupil gender is also included.	LSOA MSOA
KS2 Results	Office for National Statistics	National Curriculum Assessments at Key Stage 2 by Gender in England (Referenced by Location of Pupil Residence), 2009	This dataset provides the total number of pupils in maintained schools eligible for KS2 assessment and the percentage of eligible pupils in each subject achieving KS2 Level 4 or above in English, Mathematics, Science and English and Mathematics combined. The average KS2 point scores per pupil and an overall breakdown by gender is also included.	LSOA MSOA
KS4 Results	Office for National Statistics	GCSE and Equivalent Results for Young People by Gender in England (Referenced by Location of Pupil Residence), 2009/2010	This dataset provides information about the GCSE and Equivalent Examination results for young people. An overall breakdown by gender is also included.	LSOA MSOA

3. Multiple regression

3.1 Data screening

Prior the running the multiple regression analysis, data screening was conducted to examine the validity of the dataset.

- Distributions were approximately normal for most predictors. In the cases of deprivation and unemployment, a large negative skew was detected. Data for these variables were then categorised into 'high / medium / low' in order to create more even distributions within each category.

- Relationships between each predictor variable were assessed for multicollinearity. Although IMD was related to the other factors (as this is a composite score including factors such as housing and health), correlations were below 0.9 for all predictors. This suggests that the IMD variable explains unique variance, beyond the explanatory power of the other predictors.

3.2 Multiple regression models

Our analysis addressed the question: 'how are indicators of disadvantage related to educational attainment?' To explore this, we developed a series of statistical models in which we attempted to explain variations in educational attainment across neighbourhoods by exploring the apparent impacts of indicators of disadvantage. These models were:

- Neighbourhood Foundation Score ≈ health + deprivation + unemployment + adult education + housing
- Neighbourhood Key Stage 2 score ≈ health + deprivation + unemployment + adult education + housing
- Neighbourhood Key Stage 4 score ≈ health + deprivation + unemployment + adult education + housing

We then addressed the question: 'What contribution does each indicators of disadvantage make to explaining differences in educational attainment?' Taking the indicators in turn:

- **Deprivation:** We categorised deprivation scores into three groups – high, medium and low. For neighbourhoods with high deprivation scores, the percentage of children attaining at nationally expected levels or above decreased by: 4.12 per cent at the Foundation Stage; 5.45 per cent at Key Stage 2; and 12.14 per cent at Key Stage 4 compared to neighbourhoods of low deprivation. This shows that deprivation is very strongly related to academic outcomes. Of note is the increasing magnitude of effect for attainment at Key Stage 4. This may be something to do with the way attainment is measured at this key stage, or it may suggest that disadvantage has a cumulative effect on academic attainment at neighbourhood level.
- **Unemployment:** We categorised unemployment scores into three groups – high, medium and low. For neighbourhoods with high unemployment scores, the percentage of children attaining at nationally expected levels or above decreased by: 2 per cent at the Foundation Stage; 1.77 per cent at Key Stage 2; and 2 per cent at Key Stage 4 when compared to neighbourhoods of low unemployment.

- **Adult Education:** As the percentage of adults without formal education increases by one point, the percentage of children attaining at nationally expected levels or above decreases by: 0.112 per cent at the Foundation Stage; 0.170 per cent at Key Stage 2; and 0.518 per cent at Key Stage 4.
- **Health:** As the percentage of people who report themselves to be in good health increases by 1 percent, the percentage of children attaining at nationally expected levels or above increases by: 0.161 per cent at the Foundation Stage; 0.078 per cent at Key Stage 2; and decreases by 0.201 per cent at Key Stage 4.
- **Housing:** As the barriers to housing and services score increases by one point, the percentage of children attaining at nationally expected levels or above decreases by: .022 per cent in the Foundation Stage; remains the same for Key Stage 2; and increases by .072 per cent at Key Stage 4.

3.3 Output of Multiple regression

Foundation stage

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.335[a]	.112	.112	11.20851

a. Predictors: (Constant), ADULT EDUCATION - NO QUALIFICATIONS (PERCENTAGE), HOUSING - BARRIERS TO HOUSING AND SERVICES SCORE, Where medium unemployment is compared with low unemployment, Where medium deprivation is compared with low deprivation, HEALTH - GOOD HEALTH (PERCENTAGE), Where high unemployment is compared with low unemployment, Where high deprivation is compared with low deprivation

ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	214852.788	7	30693.255	244.313	.000[a]
	Residual	1704180.278	13565	125.631		
	Total	1919033.066	13572			

Coefficients[a]

Model	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	69.940	2.337		28.211	.000
Where medium deprivation is compared with low deprivation	-2.023	..390	-.077	-5.184	.000
Where high deprivation is compared with low deprivation	-4.448	.511	-.172	-8.057	.000
Where medium unemployment is compared with low unemployment	-.947	.369	-.036	-2.564	.015
Where high unemployment is compared with low unemployment	-2.036	.456	-.085	-4.467	.000
HEALTH - GOOD HEALTH (PERCENTAGE)	.161	.029	.081	5.634	.000
HOUSING - BARRIERS TO HOUSING AND SERVICES SCORE	-.022	.010	-.021	-2.361	.018
ADULT EDUCATION - NO QUALIFICATIONS (PERCENTAGE)	-.112	.015	-.106	-7.234	.000

a. Dependent Variable: FOUNDATION STAGE - PUPILS ACHIEVING 78 OR MORE POINTS ACROSS ALL SCALES (PERCENTAGE)

Key stage 2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.390[a]	.152	.151	10.96412

a. Predictors: (Constant), HOUSING - BARRIERS TO HOUSING AND SERVICES SCORE, Where medium deprivation is compared with low deprivation, HEALTH - GOOD HEALTH (PERCENTAGE), Where medium unemployment is compared with low unemployment, Where high unemployment is compared with low unemployment, ADULT EDUCATION - NO QUALIFICATIONS (PERCENTAGE), Where high deprivation is compared with low deprivation

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	356691.926	7	50955.989	423.885	.000[a]
	Residual	494434.542	16591	120.212		
	Total	2351126.468	16598			

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	70.667	2.102		33.614	.000
HEALTH - GOOD HEALTH (PERCENTAGE)	.078	.026	.039	3.044	.002
Where medium deprivation is compared with low deprivation	-3.093	.309	-.121	-10.006	.000
Where high deprivation is compared with low deprivation	-5.447	.433	-.228	-12.582	.000
Where medium unemployment is compared with low unemployment	-.563	.292	-.022	-1.928	.054
Where high unemployment is compared with low unemployment	-1.767	.388	-.074	-4.589	.000
ADULT EDUCATION - NO QUALIFICATIONS (PERCENTAGE)	-.170	.015	-.185	-11.444	.000
HOUSING - BARRIERS TO HOUSING AND SERVICES SCORE	.001	-.185	.001	-.185	.853

a. Dependent Variable: KS2 - Pupils Achieving Level 4+; in Both English and Mathematics (percentage)

Key Stage 4

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.609[a]	.371	.370	12.19661

a. Predictors: (Constant), HOUSING - BARRIERS TO HOUSING AND SERVICES SCORE, Where medium deprivation is compared with low deprivation, HEALTH - GOOD HEALTH (PERCENTAGE), Where medium unemployment is compared with low unemployment, Where high unemployment is compared with low unemployment, ADULT EDUCATION - NO QUALIFICATIONS (PERCENTAGE), Where high deprivation is compared with low deprivation

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2035326.529	7	290760.933	1954.601	.000[a]
	Residual	3456075.857	23233	148.757		
	Total	5491402.386	23240			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	89.293	1.981		45.073	.000
	HEALTH - GOOD HEALTH (PERCENTAGE)	-.201	.024	-.079	-8.342	.000
	Where medium deprivation is compared with low deprivation	-5.992	.264	-.185	-22.703	.000
	Where high deprivation is compared with low deprivation	-12.140	.394	-.383	-30.788	.000
	Where medium unemployment is compared with low unemployment	-1.168	.249	-.036	-4.690	.000
	Where high unemployment is compared with low unemployment	-2.004	.350	-.063	-5.725	.000
	ADULT EDUCATION - NO QUALIFICATIONS (PERCENTAGE)	-.518	.014	-.357	-36.177	.000
	HOUSING - BARRIERS TO HOUSING AND SERVICES SCORE	.072	.008	.052	9.199	.000

a. Dependent Variable: KS4 - All Pupils at the End of KS4 Achieving 5+ A* - C Including English and Mathematics (percentage)