

Annex: Update to severity adjustments methodology

Finalised methodology

The Office for National Statistics (ONS) Methodology Advisory Service have developed a method to quantify the effect of the introduction of injury-based reporting systems (CRASH and COPA) on the number of serious and slight injuries reported to the police. Progress in the development of this methodology was published in an [interim report](#) in September 2018 and a [final report](#) in July 2019. In the July publication, the Department confirmed its intention to use a method based on a logistic regression model, including allowing a different trend in the probability of a casualty being serious for each police force. This model has now been completed and adjusted severity figures for police force and local authority breakdowns have been published with the Reported road casualties Great Britain 2018 annual report. These can be found in tables [RAS30038](#) for local authorities and [RAS30007](#) for police forces. This annex provides further information on the model, and guidance on the use of record-level adjustment data made available to the public.

Subject to feedback from users and police forces, and to changes in underlying assumptions if these are clearly no longer justified by the data, the Department intends to continue to use this method in the future. The model will be updated each year, as new data become available. This will in itself result in changes to the estimates for all years, which are expected to be relatively small except for police forces which move over to an injury based reporting system (IBRS). Changes to the underlying model, if required, would be likely to result in larger changes to estimates. Such changes and uncertainty in the adjusted estimates in large measure reflect the difficulty in estimating differences in the way different police forces have used and continue to use non-injury based reporting systems (NIBRS). In other words, they reflect hidden differences in the meanings of 'serious' between police forces not using injury based systems. Nevertheless, the model is stable enough that broad trends are not expected to be affected even by major changes in the regression model. Several criteria will be considered to ensure the adjustment method is robust and to assess whether the underlying model needs reviewing:

- The assumptions still hold, for instance that changes in severity reporting systems lead to changes in severity but not changes in the overall number of casualties; that the IBRS effect is similar across all casualty road user types.
- Any further changes in reporting that might impact the proportion of serious injuries within non-fatal casualties, such as the role of police force in the regression model, and the introduction of mobile apps.

Characterising police force trends

The regression model estimates $P(S)$ - the probability a casualty is rated 'serious' - given the characteristics of the casualty, such as road user type, whether a police officer attended, weather, police force, and whether an IBRS is used. To fit the data adequately each police force has been allowed its own effect, its own trend over time, and its own IBRS effect. The adjustment figures estimated for some police forces depend strongly on the inclusion of these terms, but it is clear that this approach better fits the observed data than for instance forcing a single trend over time and a single IBRS effect size for all forces.

Where a police force is still using a non-injury based severity reporting system the IBRS effect cannot be estimated from data, rather the adjustments are based on the assumption that they follow the median police force IBRS estimate. As more forces move to injury-based reporting systems, we will reassess which force is the median estimate and therefore the basis of this assumption for NIBRS forces.

As published previously in the ONS final report, the adjustment figure comparisons between the time series and the logistic regression methods are provided for police forces for the purpose of assessing the quality of the trends obtained. Most notably, this characterisation of police force trends has resulted in a better estimation of change following the introduction of COPA in the Metropolitan Police Service, which has impacted the national estimates. Compared to previous adjustment figures, the total adjusted serious casualties are 9% higher in 2013, going down to being 1% higher in 2018.

Police force comparisons charts between the unadjusted and adjusted figures are presented at the end of the Annex.

Use of adjusted figures and record-level adjusted probabilities

The Department has provided record-level severity adjustment data on the road safety data.gov website alongside this release to facilitate adjusted analyses

(<https://data.gov.uk/dataset/cb7ae6f0-4be6-4935-9277-47e5ce24a11f/road-safety-data>).

Users are encouraged to use the record-level adjustment probabilities and provide feedback on the adjustment process. At both casualty and accident level, this look-up contains the model probabilities for each casualty since 2004 of being serious or slight under IBRS, which can be linked back to the main dataset and aggregated to produce adjusted totals.

It should be noted that 2004 adjustments were calculated using variables collected from an older STATS19 specification. There are differences in the way variables were recorded and categorised in 2004. Therefore, 2004 adjustment figures are indicative, and it is recommended to use adjustment figures from 2005 onwards only.

While there will be a small degree of uncertainty deriving from the probabilistic nature of the adjustments, there is much larger uncertainty deriving from choices made in the modelling process – in particular about the form of the trends used, and on the assumption for forces with no IBRS data as mentioned above. These uncertainties apply to totals according to the proportion of casualties assessed using NIBRS. The probabilities dataset includes a variable to indicate whether each casualty was recorded on IBRS or not, to help users assess the proportion of cases where IBRS was actually used. Estimates where a larger proportion of cases were actually recorded on IBRS are more reliable. Estimates for many forces are sensitive to model assumptions, and for current NIBRS forces are based on the assumption of a median IBRS effect – which is unlikely to be verified for all police forces. Therefore, there is more uncertainty in estimates of totals, and especially comparisons of totals between police forces, than there is in estimating trends or comparing trends across police forces. The uncertainties discussed here relate only to the adjustment relating to use of IBRS - users should also be aware that estimating underlying probabilities from observed proportions induces further uncertainty especially for small observed totals.

Feedback

The Department will work to roll out this adjustment approach in all tables of Reported road casualties Great Britain in 2020. Feedback from users is still welcome at roadacc.stats@dft.gov.uk on the methods used.

Police force adjustment charts

Police force comparisons charts between the unadjusted and adjusted figures are presented at the end of the Annex. Please note, for NIBRS forces there is no time series comparison as the time series comparison requires IBRS data at aggregate level to produce adjustments.

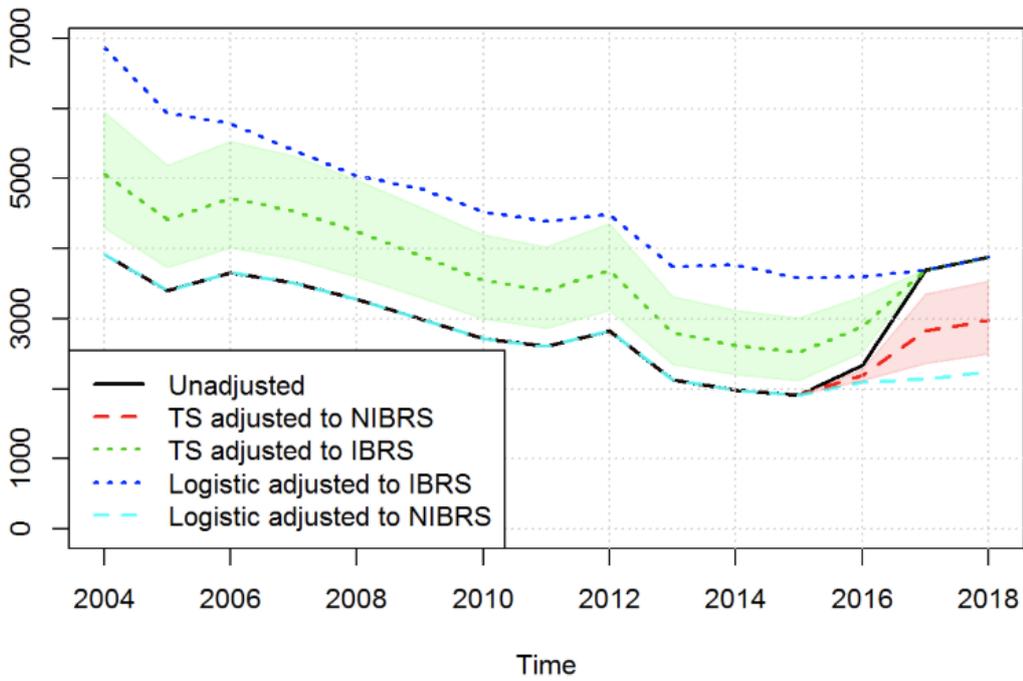


Figure 1: Unadjusted and adjusted serious injuries for the Metropolitan Police Service

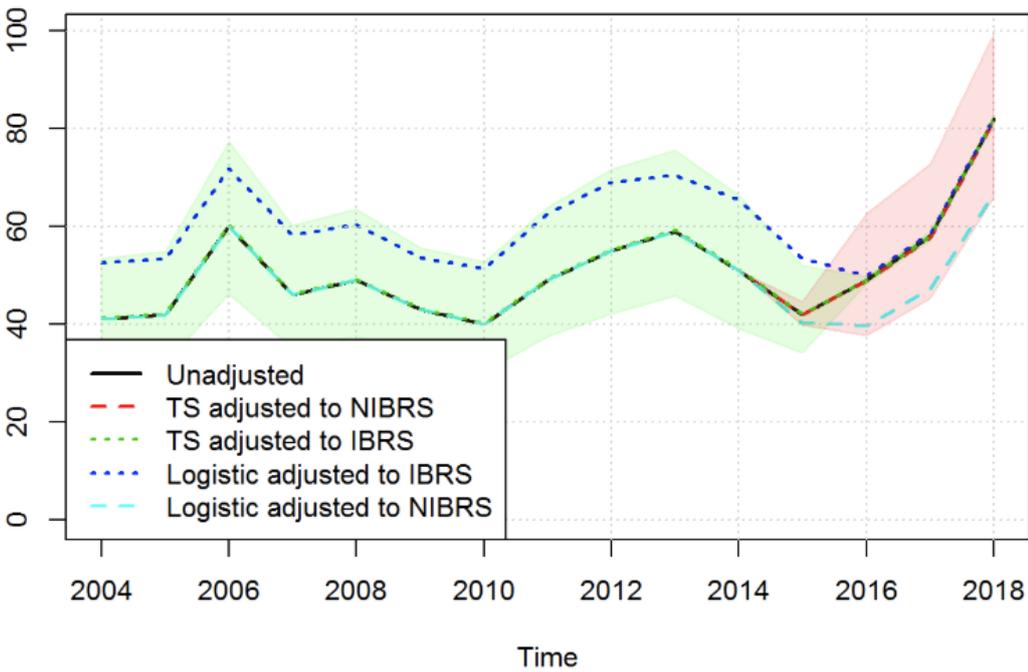


Figure 2: Unadjusted and adjusted serious injuries for City of London Police

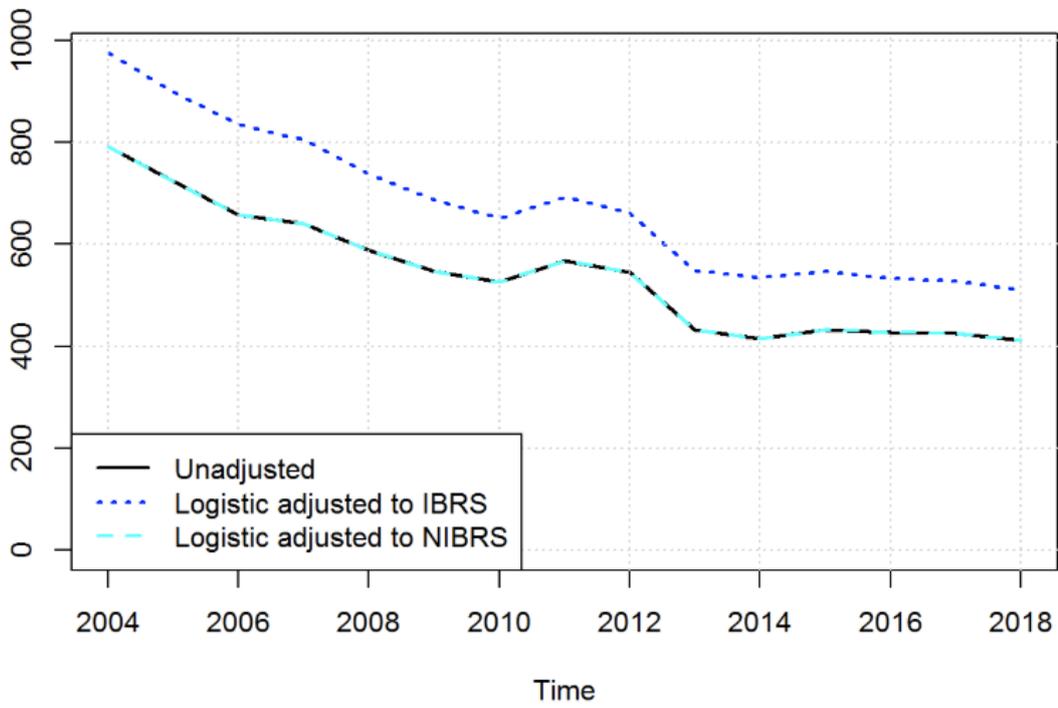


Figure 3: Unadjusted and adjusted serious injuries for Nottinghamshire Police

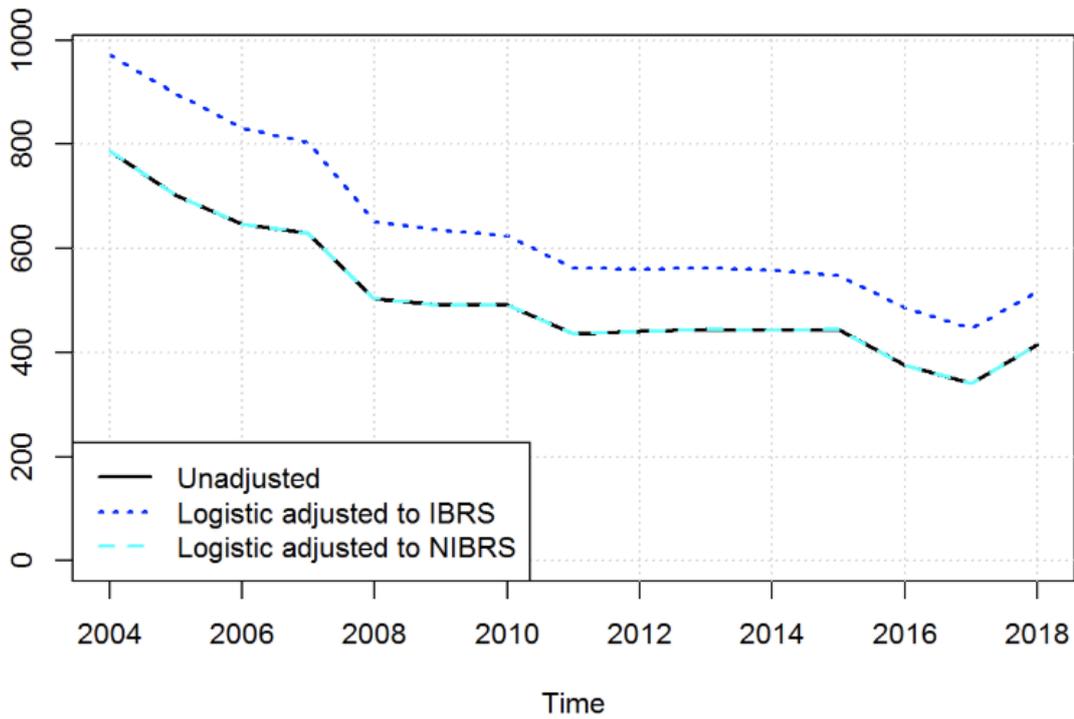


Figure 4: Unadjusted and adjusted serious injuries for Avon and Somerset Police

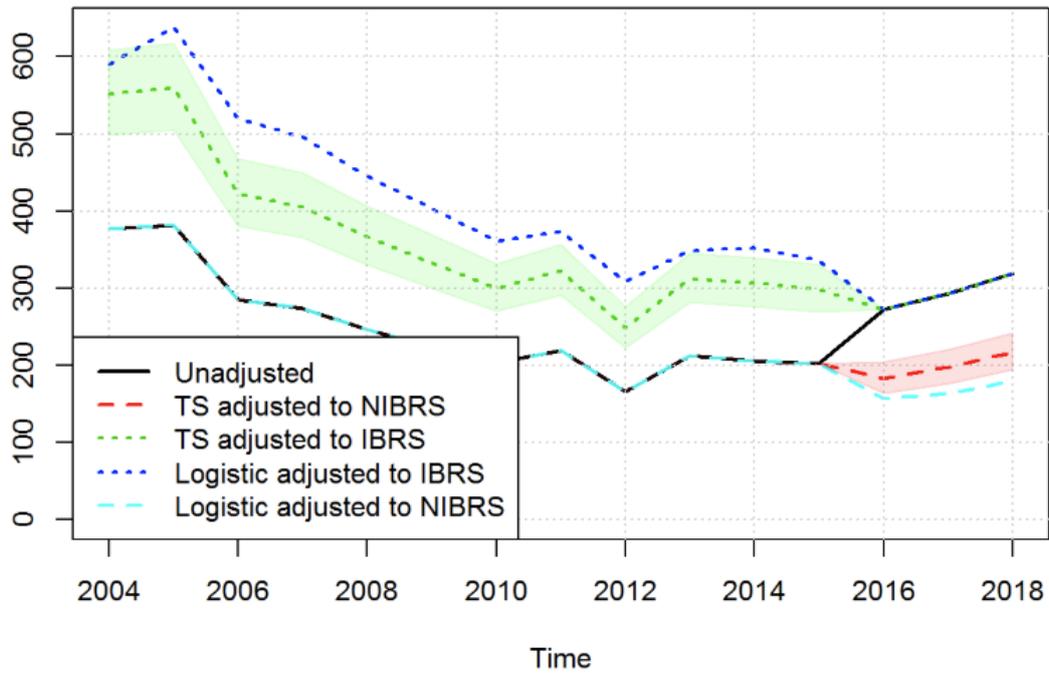


Figure 5: Unadjusted and adjusted serious injuries for Cumbria Police

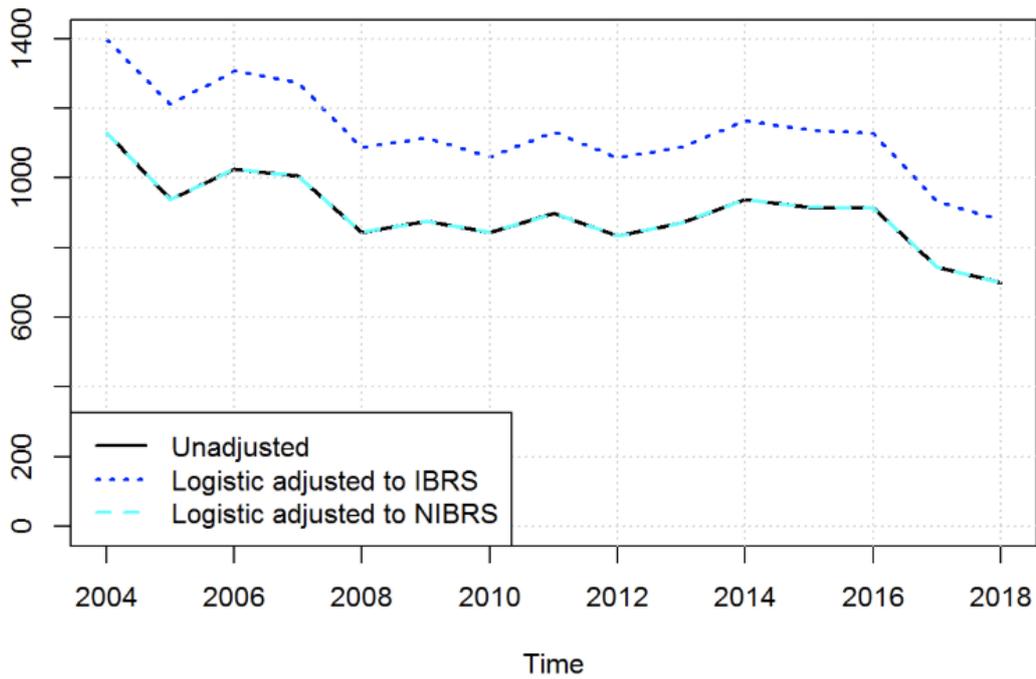


Figure 6: Unadjusted and adjusted serious injuries for Thames Valley Police

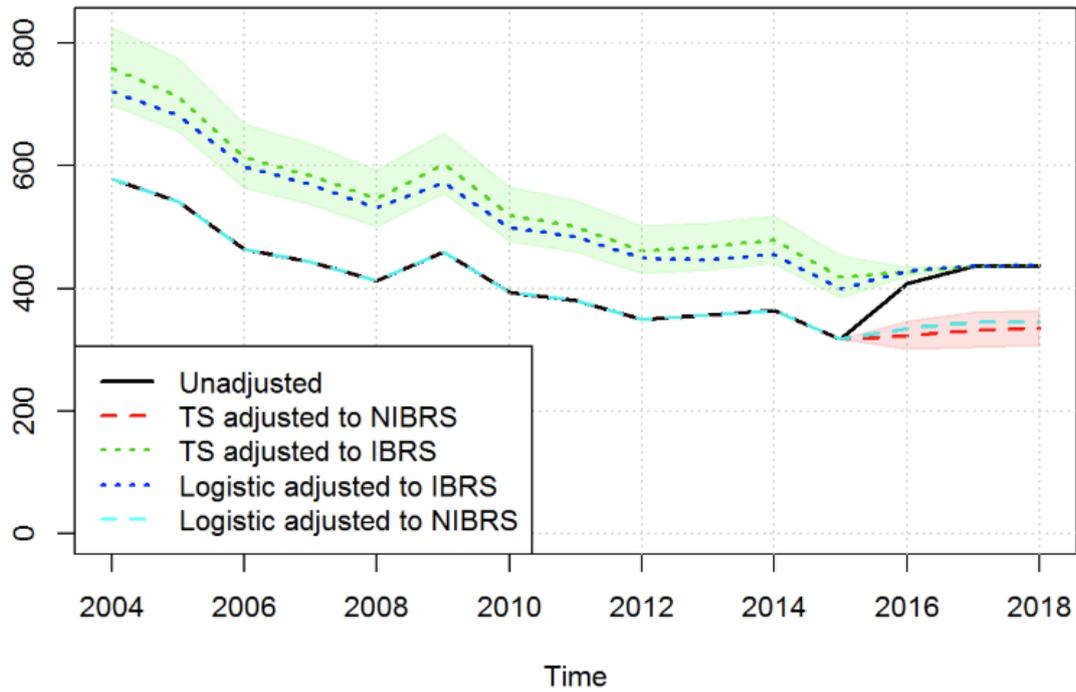


Figure 7: Unadjusted and adjusted serious injuries for Cambridgeshire Police

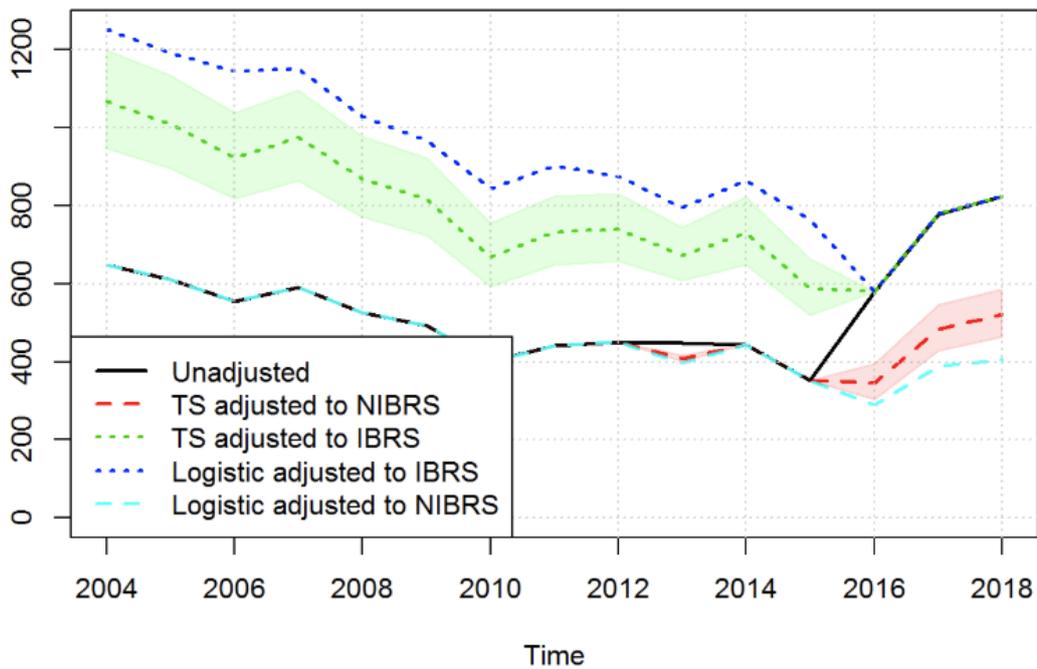


Figure 8: Unadjusted and adjusted serious injuries for South Yorkshire Police

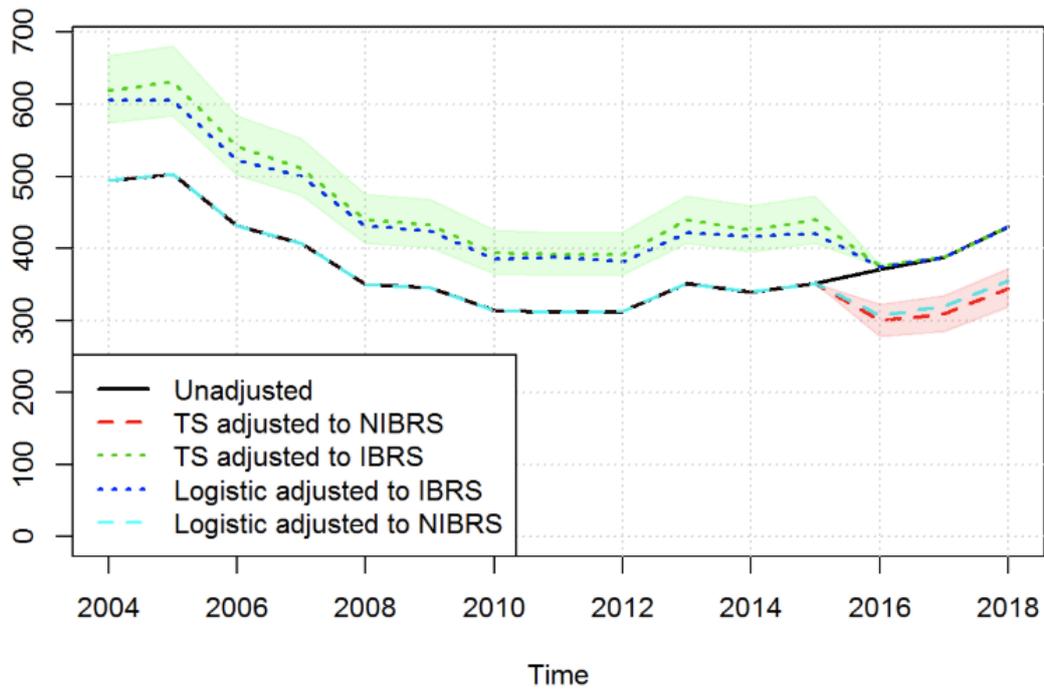


Figure 9: Unadjusted and adjusted serious injuries for Norfolk Police

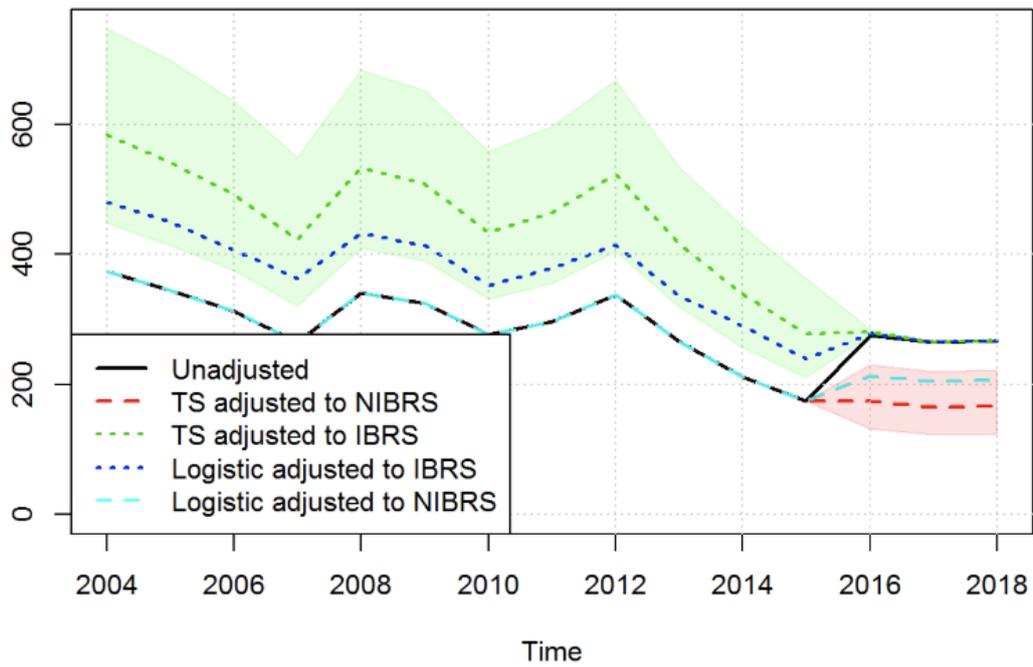


Figure 10: Unadjusted and adjusted serious injuries for Suffolk Police

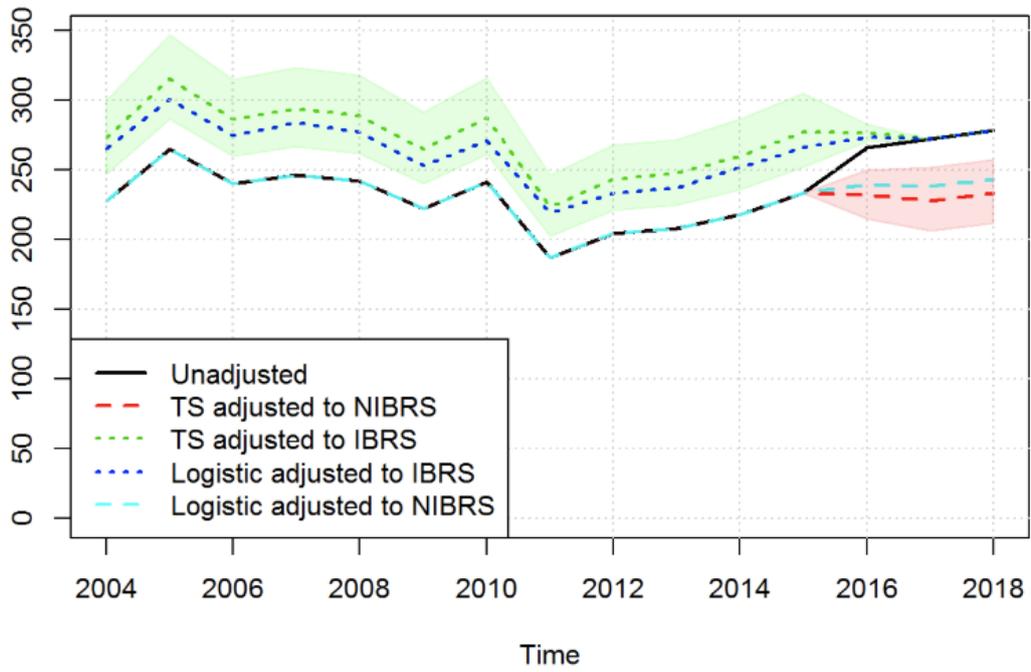


Figure 11: Unadjusted and adjusted serious injuries for Bedfordshire Police

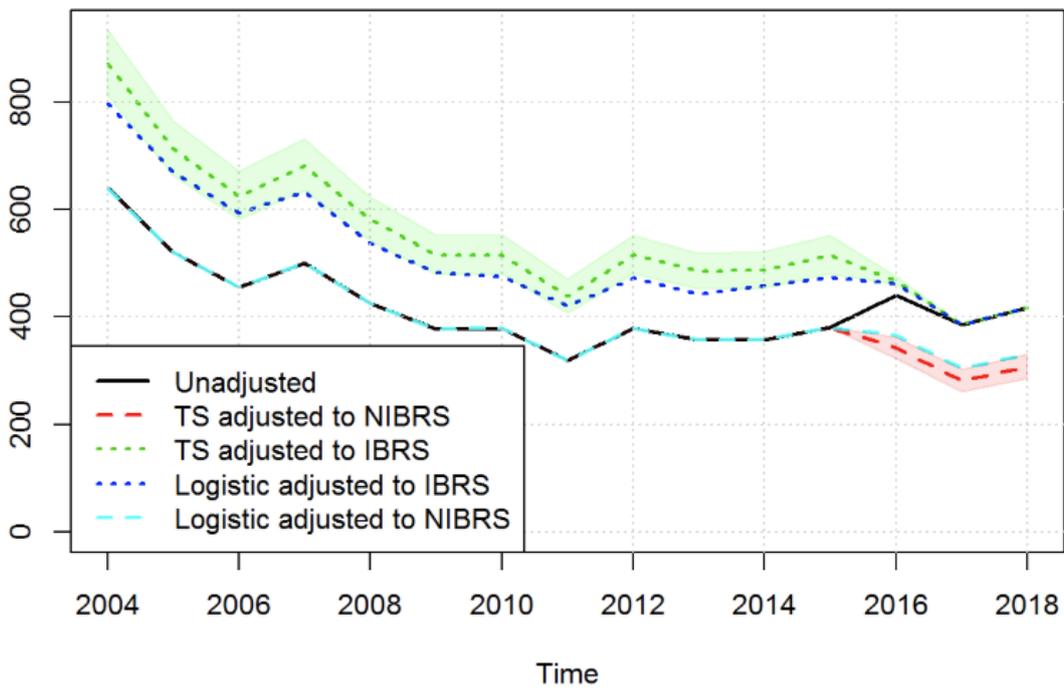


Figure 12: Unadjusted and adjusted serious injuries for Hertfordshire Police

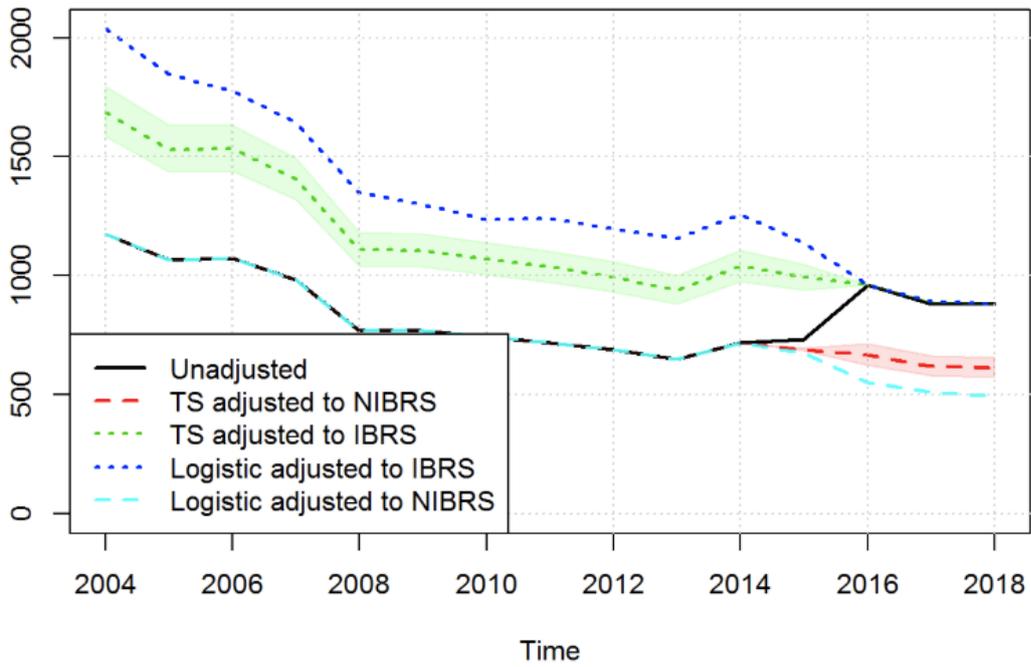


Figure 13: Unadjusted and adjusted serious injuries for Essex Police

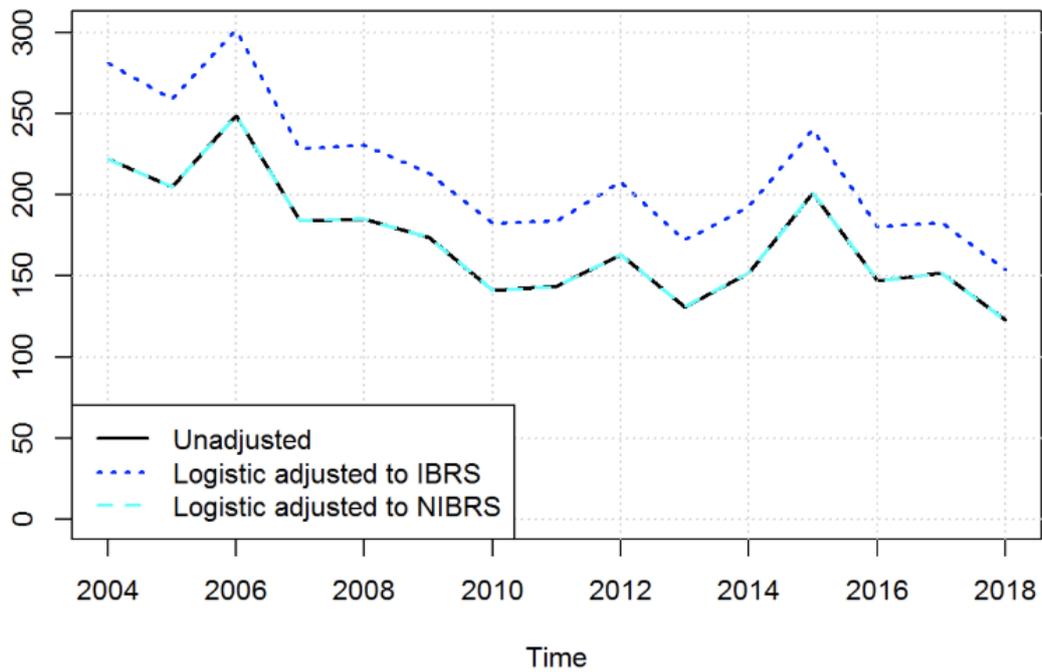


Figure 14: Unadjusted and adjusted serious injuries for Cleveland Police

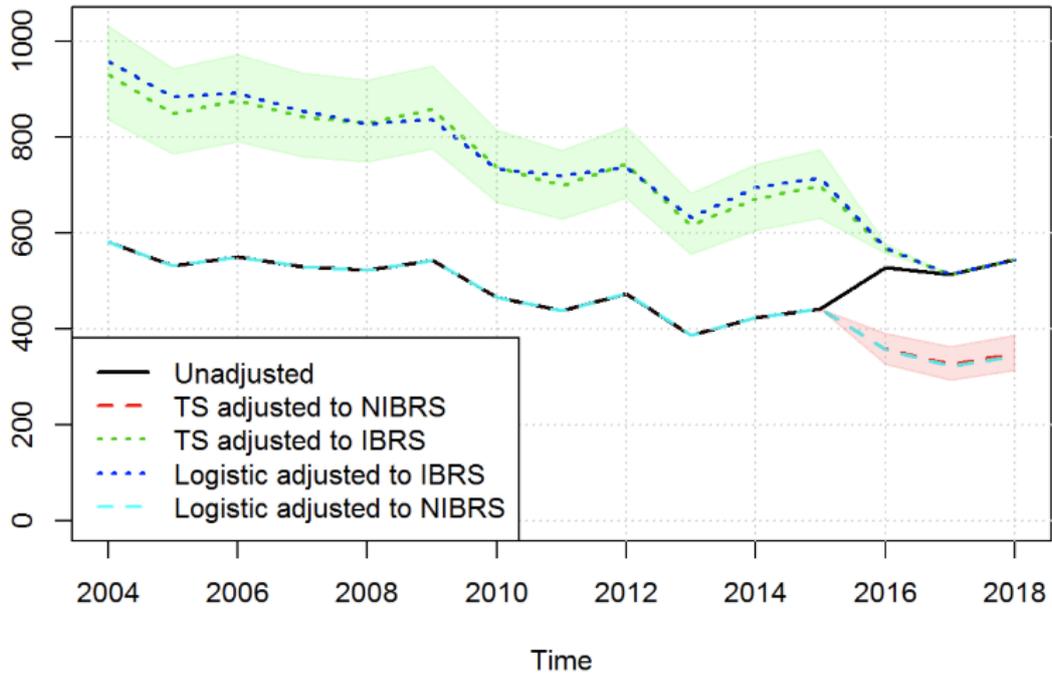


Figure 15: Unadjusted and adjusted serious injuries for Northumbria Police

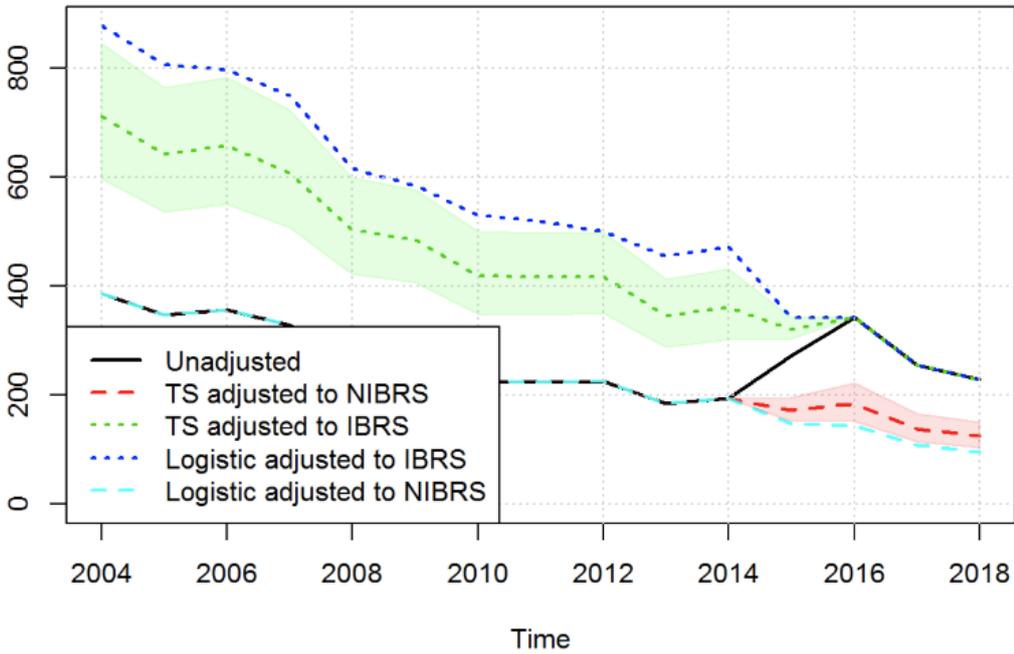


Figure 16: Unadjusted and adjusted serious injuries for Staffordshire Police

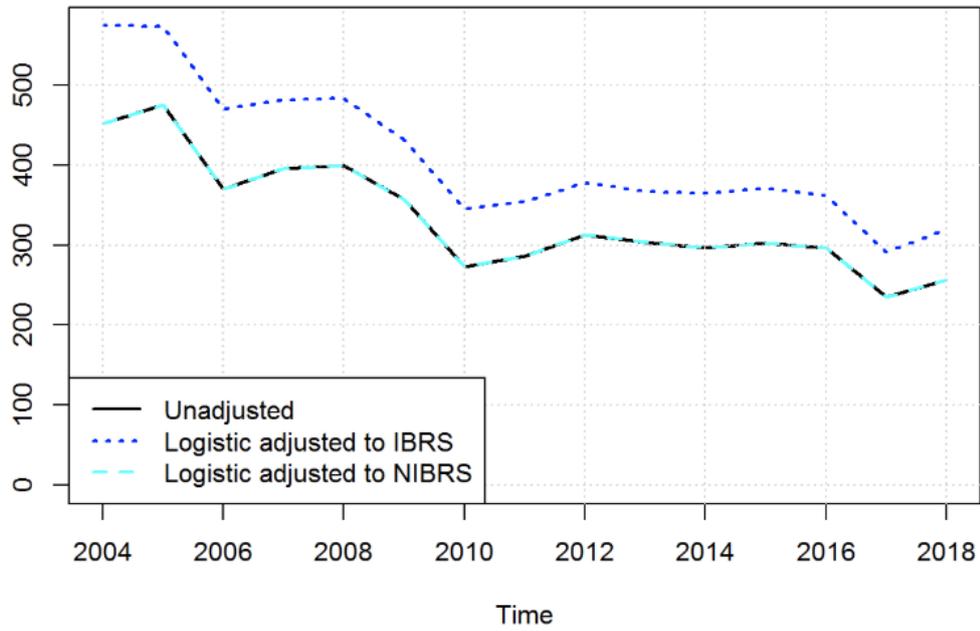


Figure 17: Unadjusted and adjusted serious injuries for Northamptonshire Police

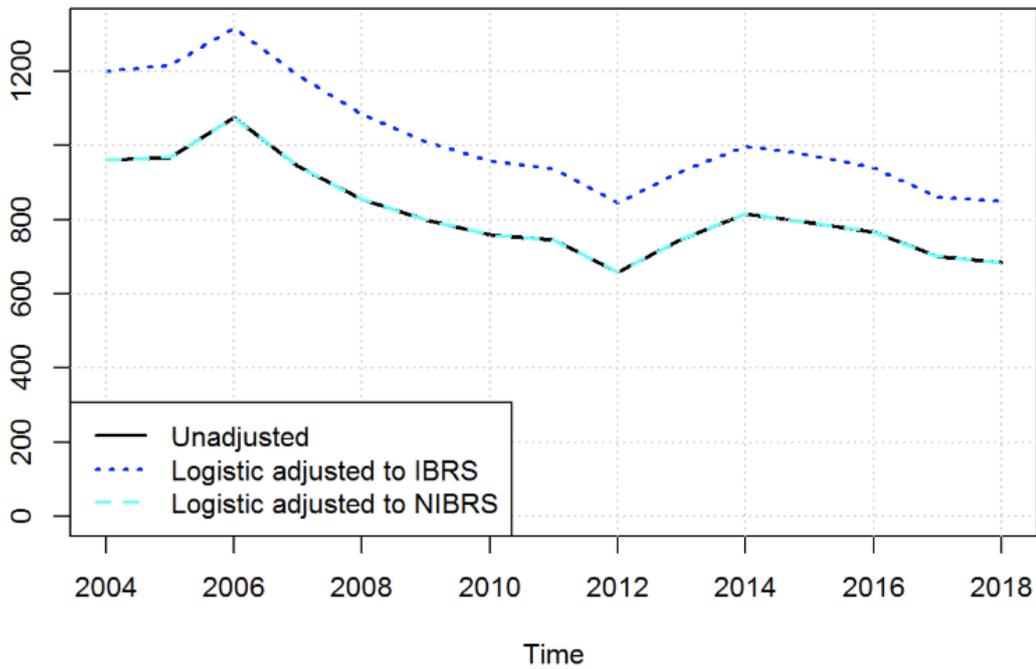


Figure 18: Unadjusted and adjusted serious injuries for Lancashire Police

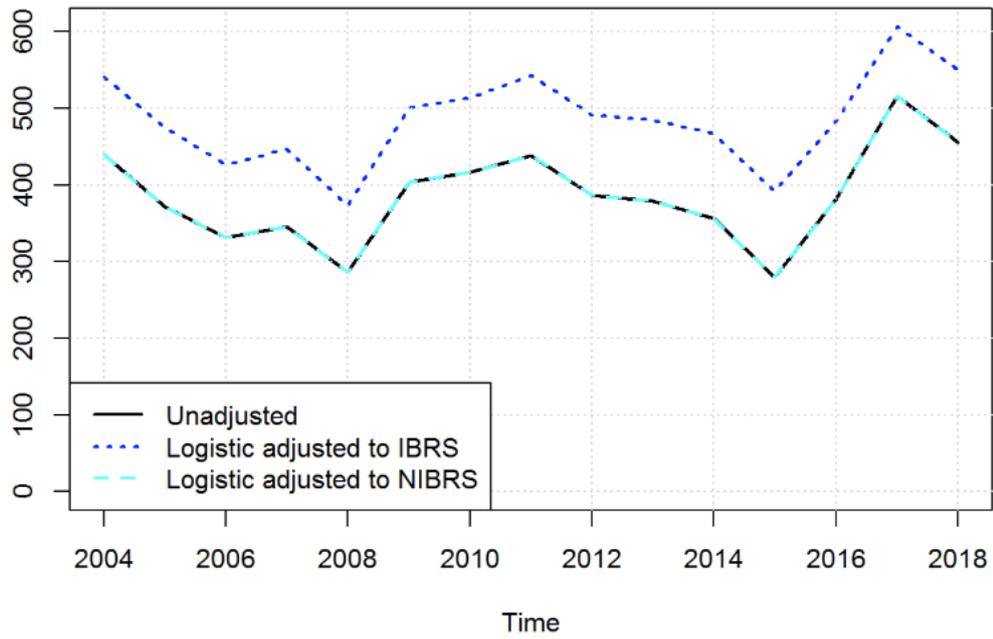


Figure 19: Unadjusted and adjusted serious injuries for Lincolnshire Police

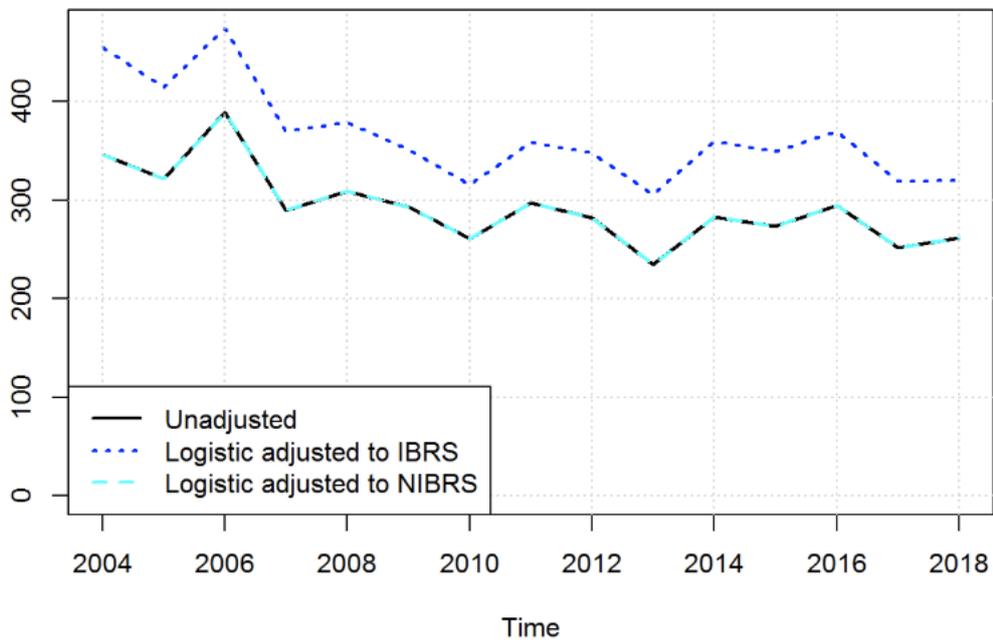


Figure 20: Unadjusted and adjusted serious injuries for Wiltshire Police

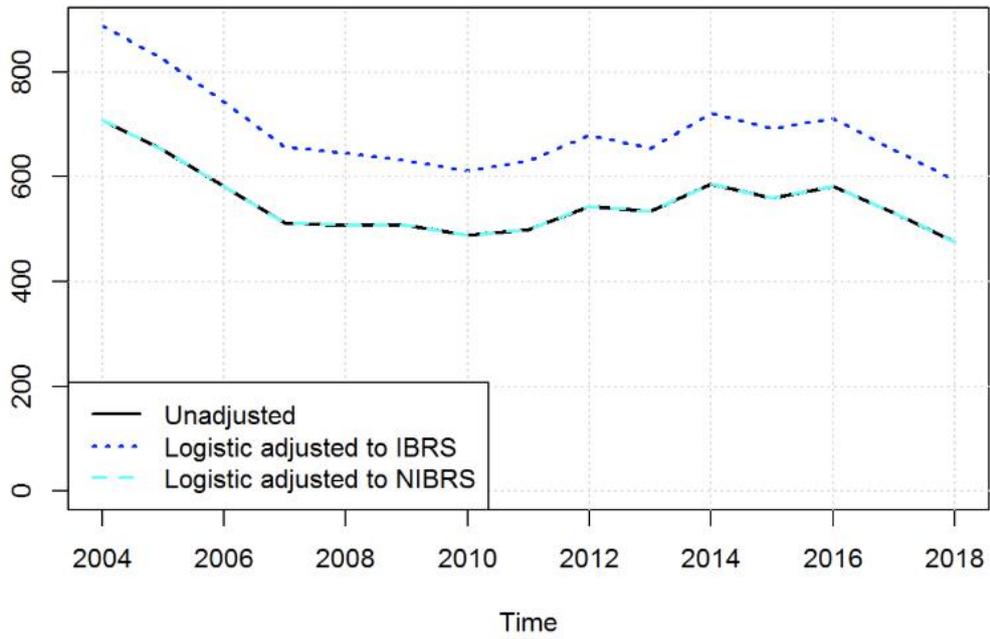


Figure 21: Unadjusted and adjusted serious injuries for Merseyside Police

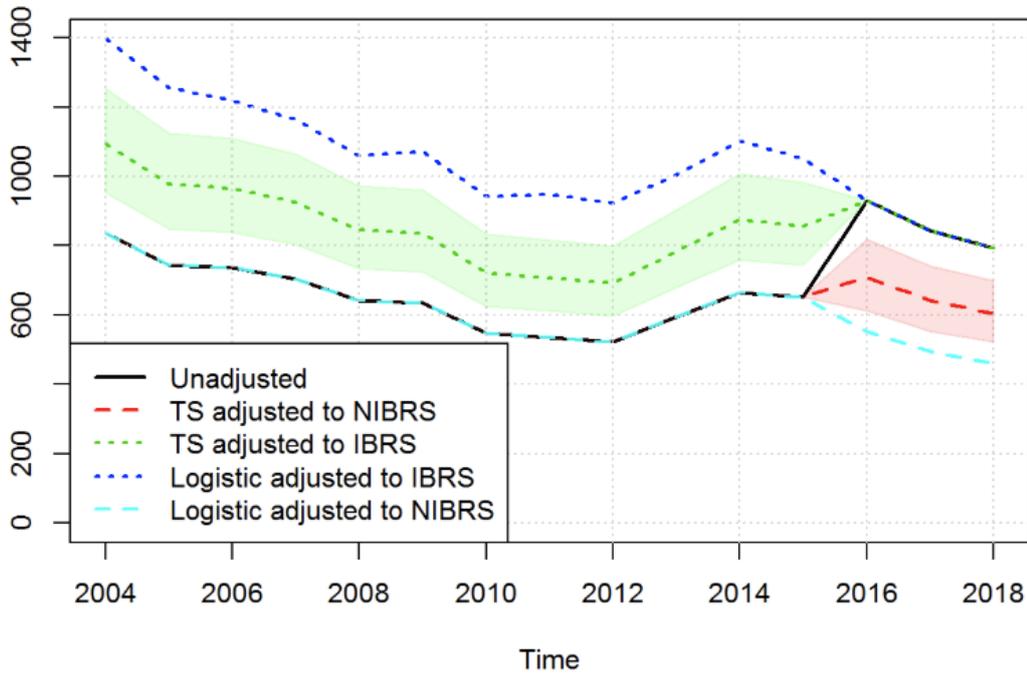


Figure 22: Unadjusted and adjusted serious injuries for Kent Police

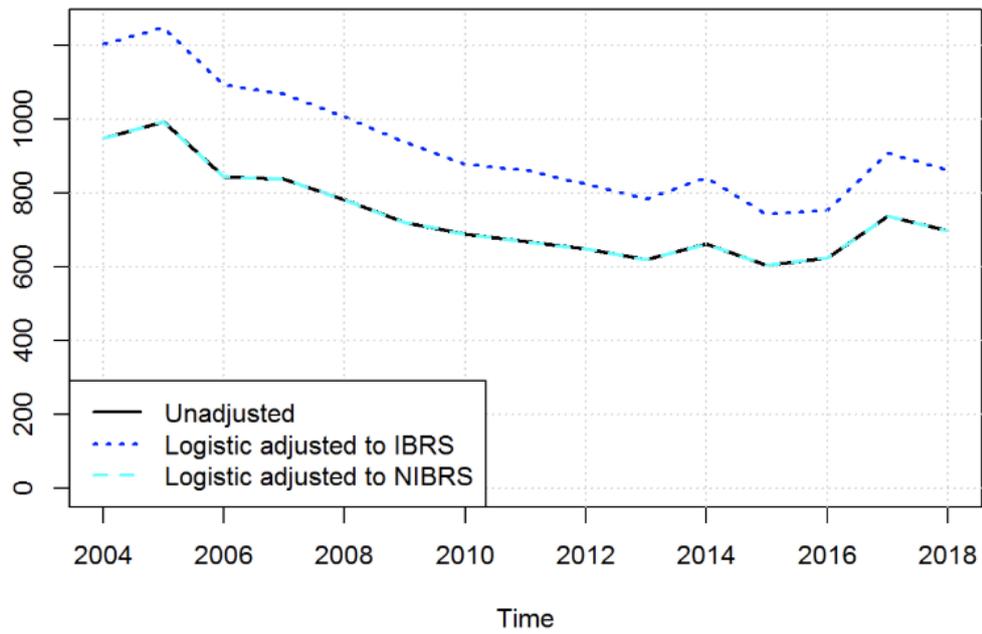


Figure 23: Unadjusted and adjusted serious injuries for Greater Manchester Police

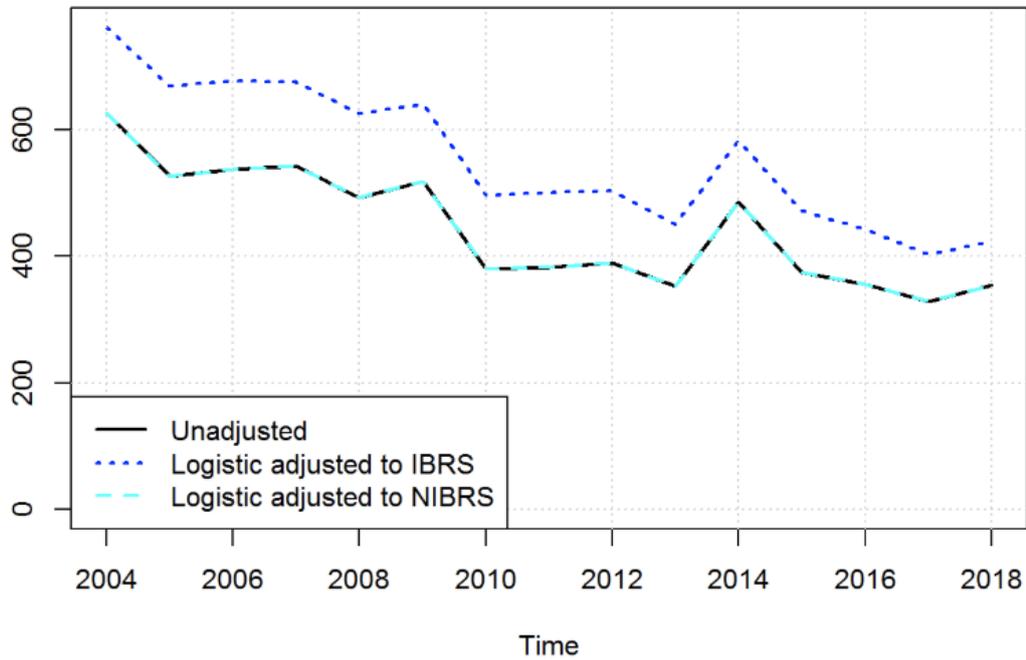


Figure 24: Unadjusted and adjusted serious injuries for Derbyshire Police

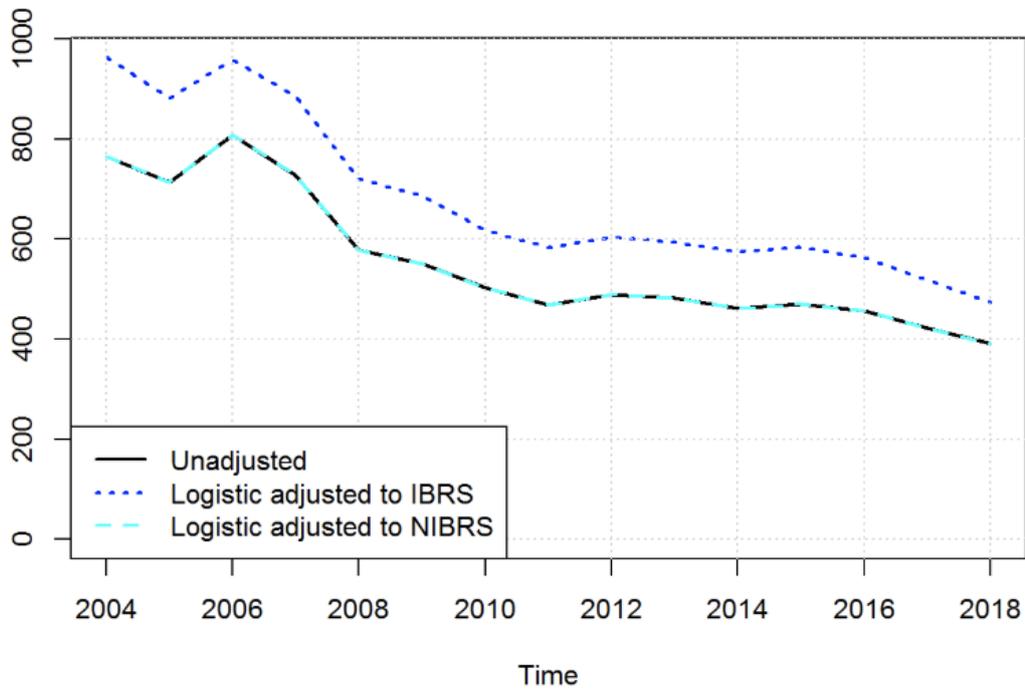


Figure 25: Unadjusted and adjusted serious injuries for North Yorkshire Police

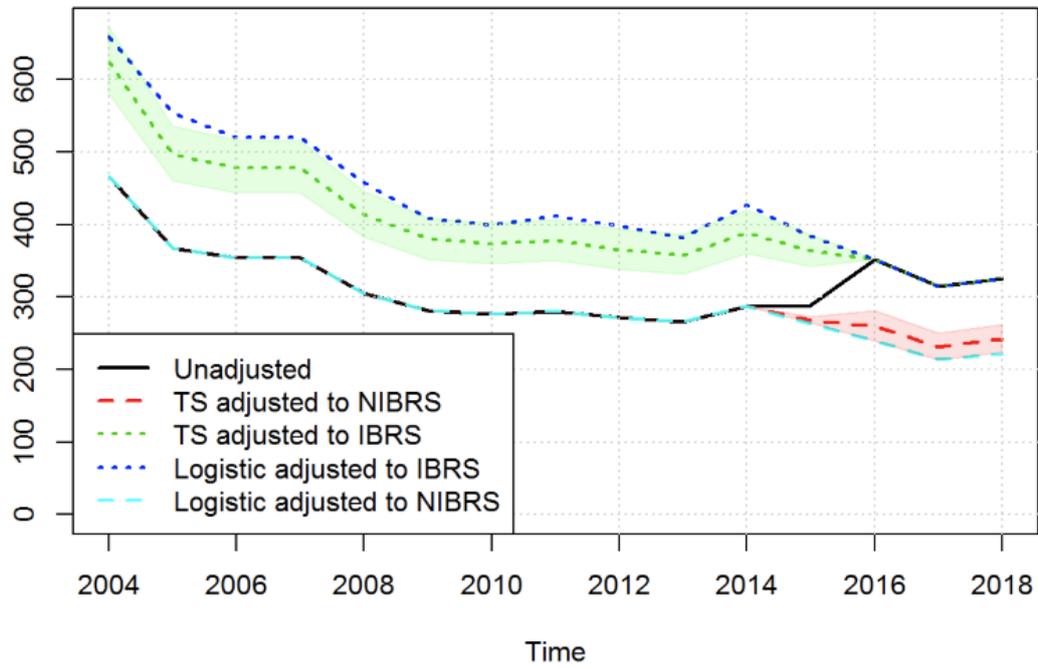


Figure 26: Unadjusted and adjusted serious injuries for Warwickshire Police

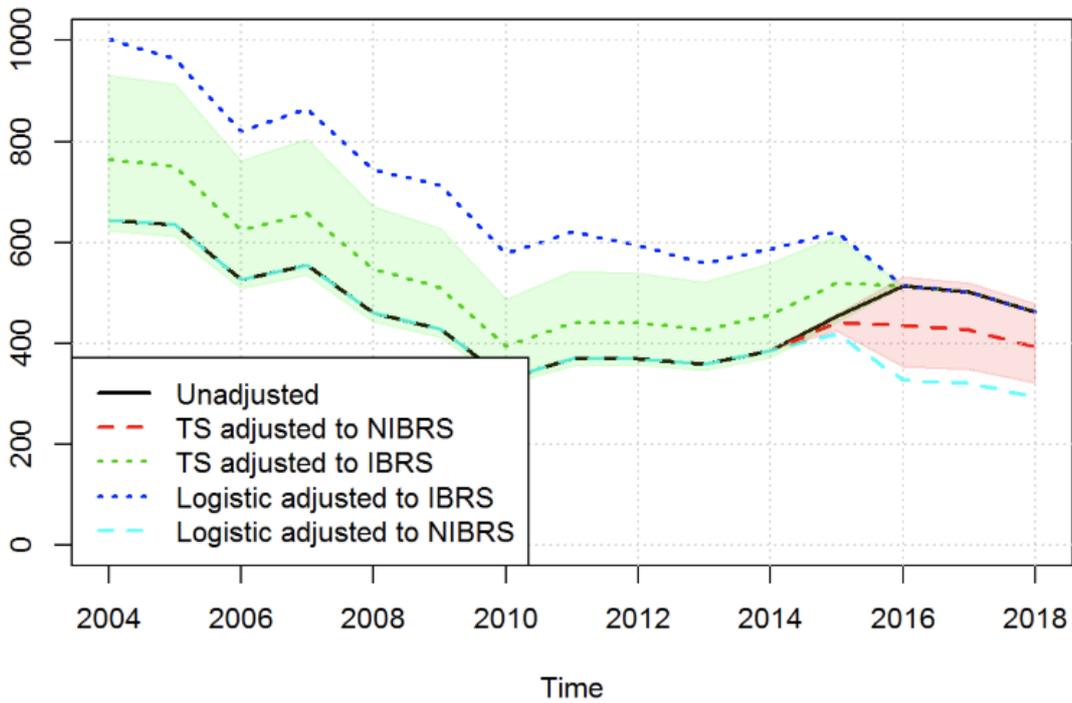


Figure 27: Unadjusted and adjusted serious injuries for West Mercia Police

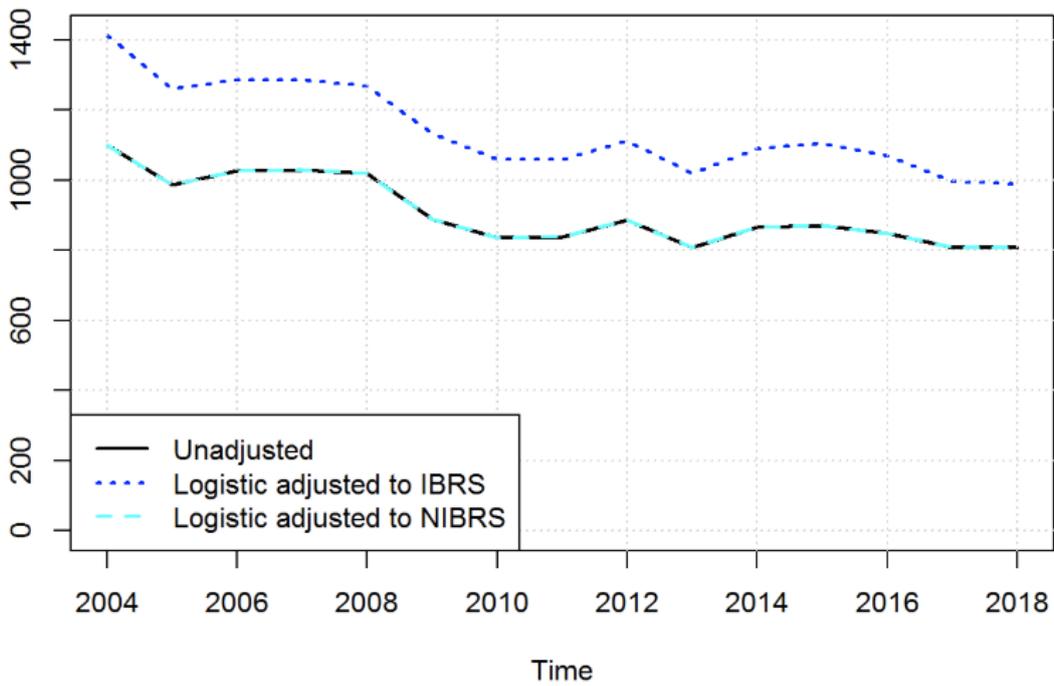


Figure 28: Unadjusted and adjusted serious injuries for West Yorkshire Police

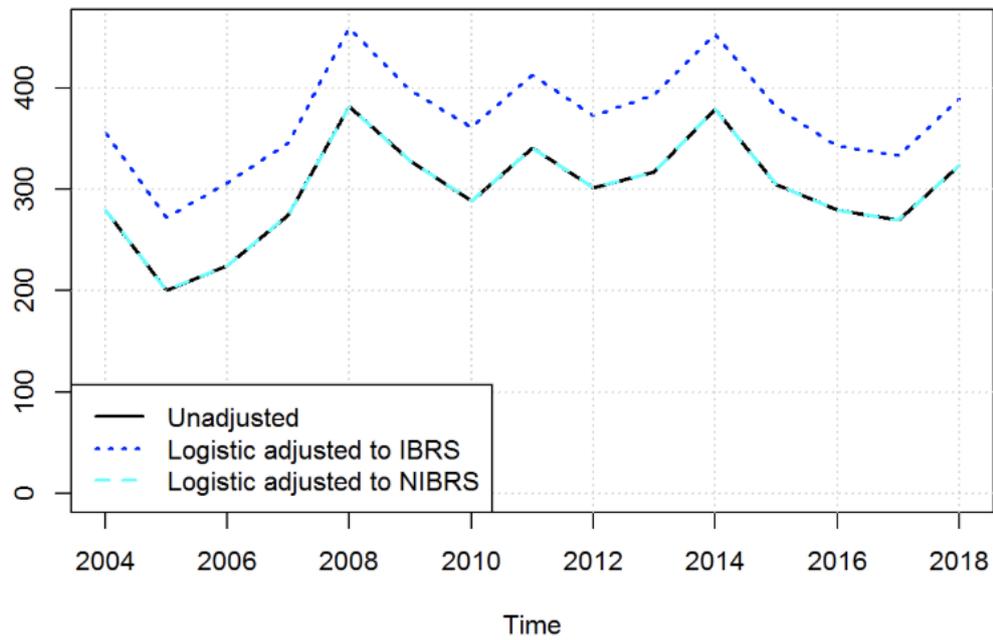


Figure 29: Unadjusted and adjusted serious injuries for North Wales Police

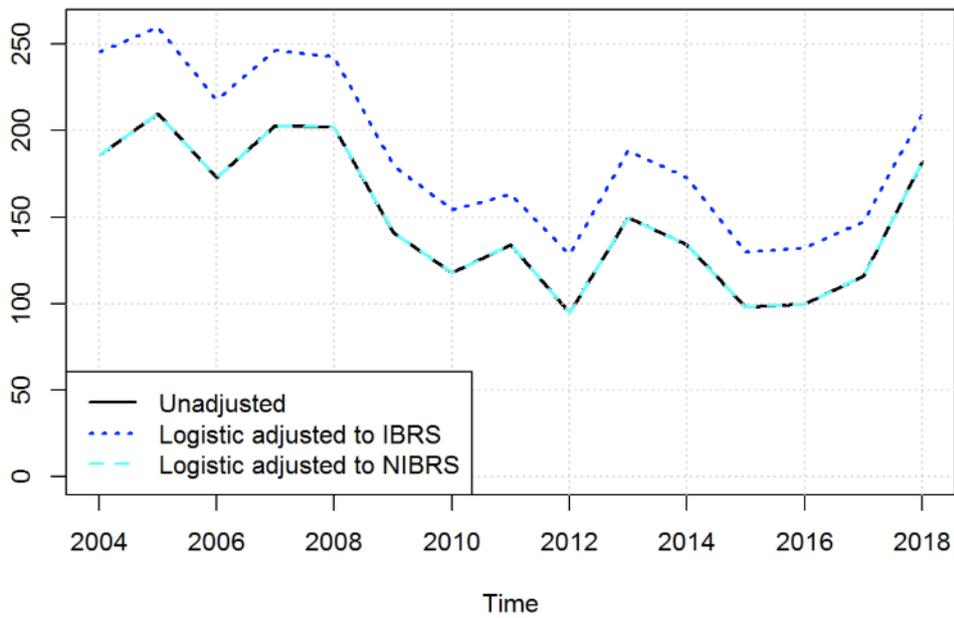


Figure 30: Unadjusted and adjusted serious injuries for Gwent Police

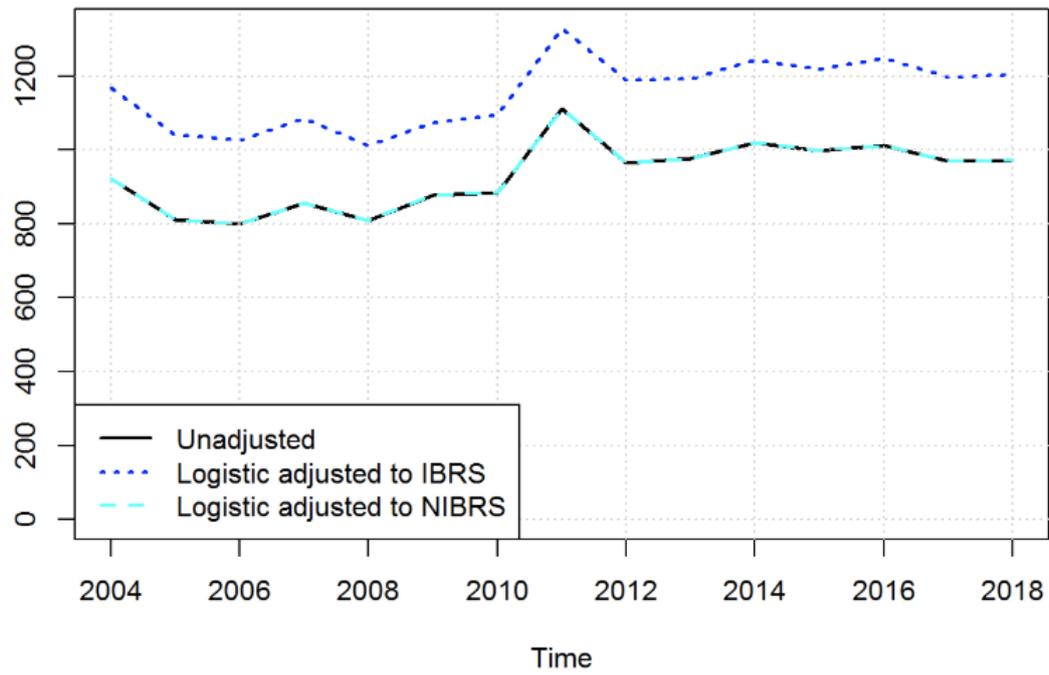


Figure 31: Unadjusted and adjusted serious injuries for Hampshire Police

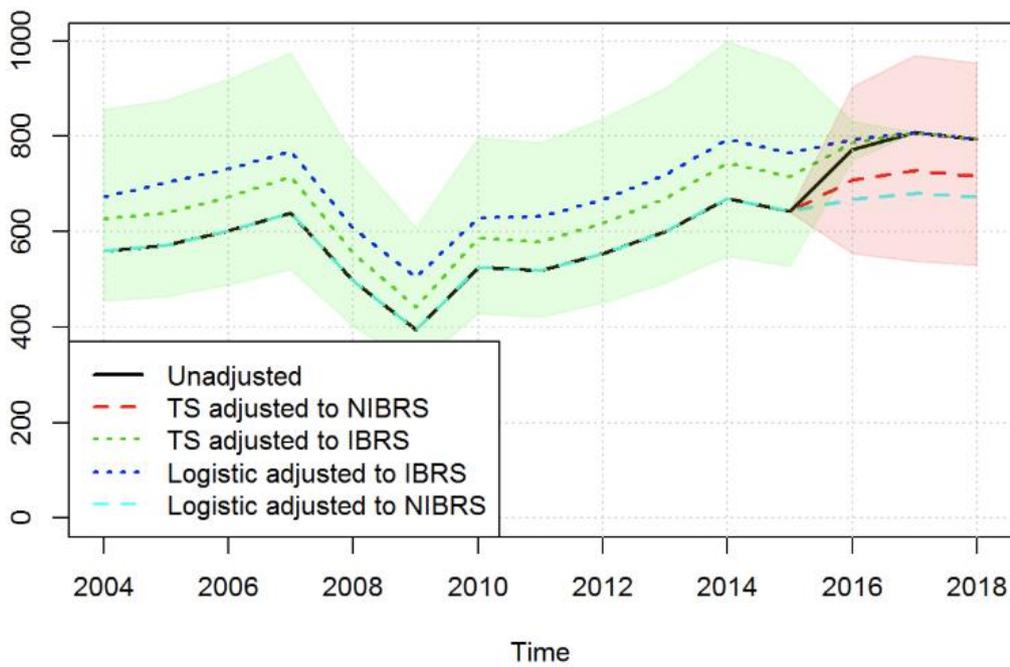


Figure 32: Unadjusted and adjusted serious injuries for Devon and Cornwall Police

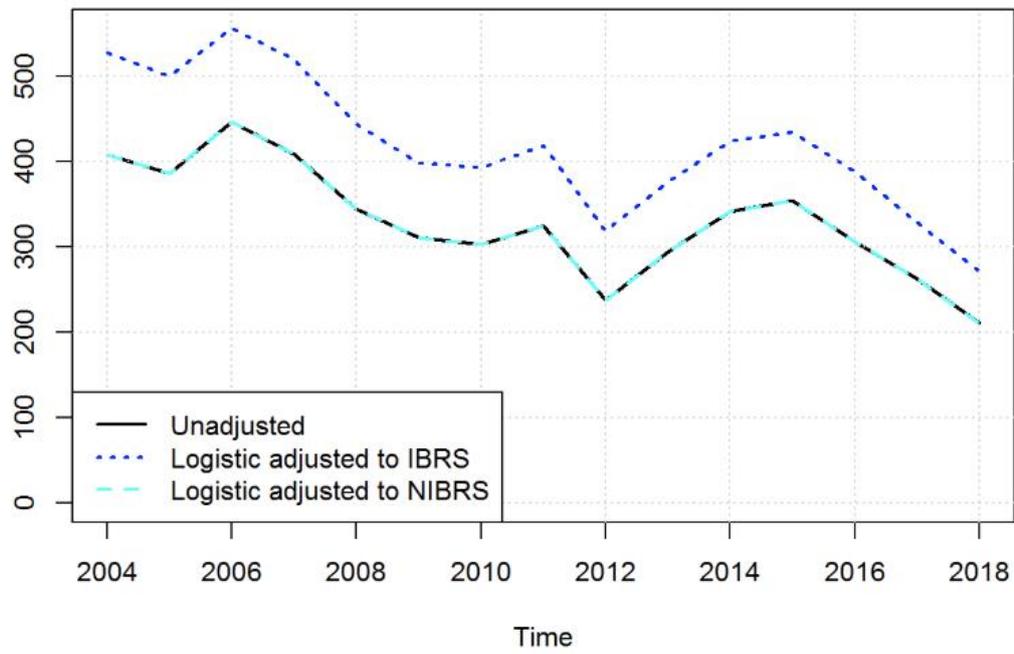


Figure 33: Unadjusted and adjusted serious injuries for South Wales Police

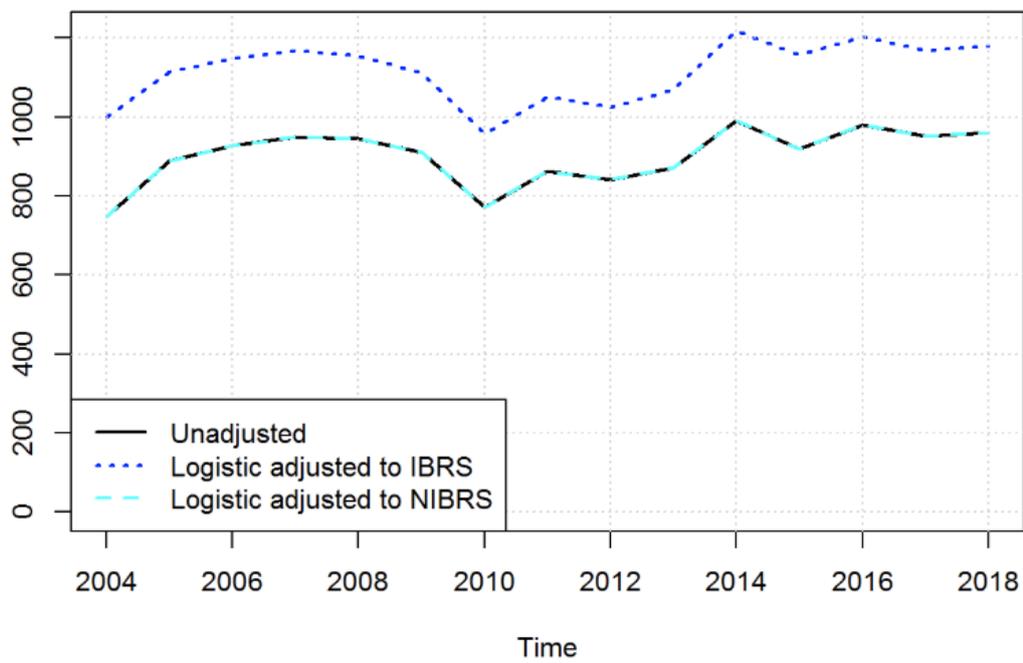


Figure 34: Unadjusted and adjusted serious injuries for Sussex Police

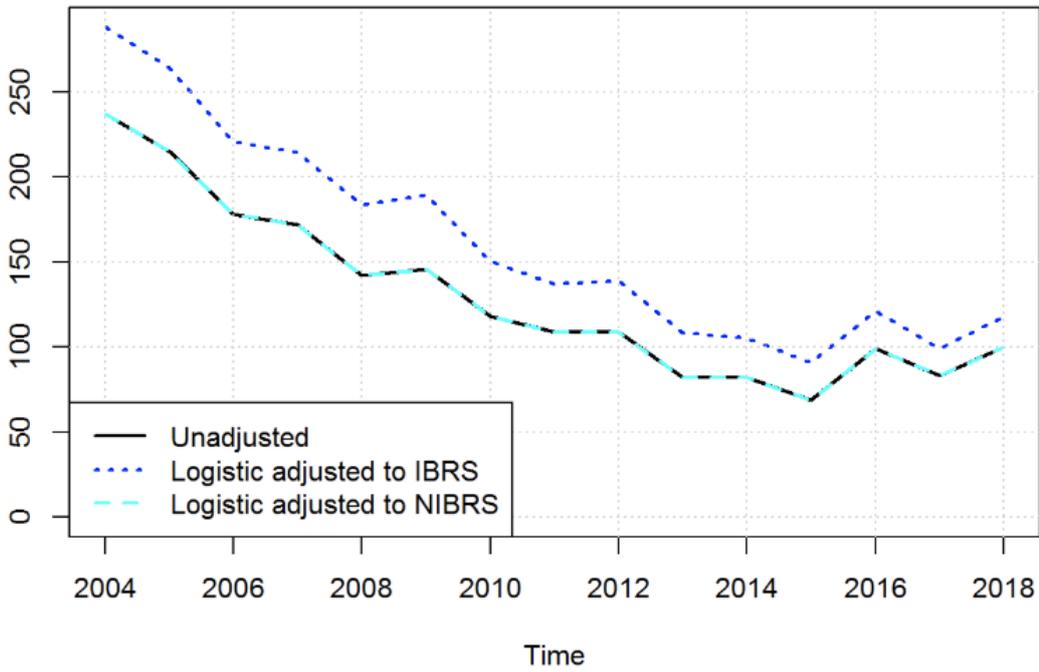


Figure 35: Unadjusted and adjusted serious injuries for Northern Police

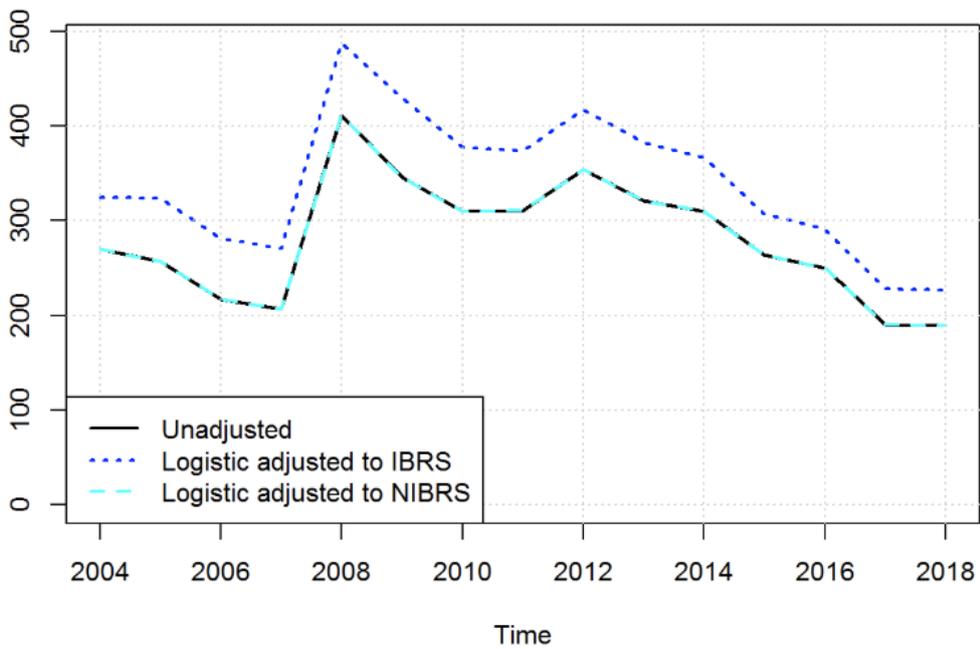


Figure 36: Unadjusted and adjusted serious injuries for Grampian Police

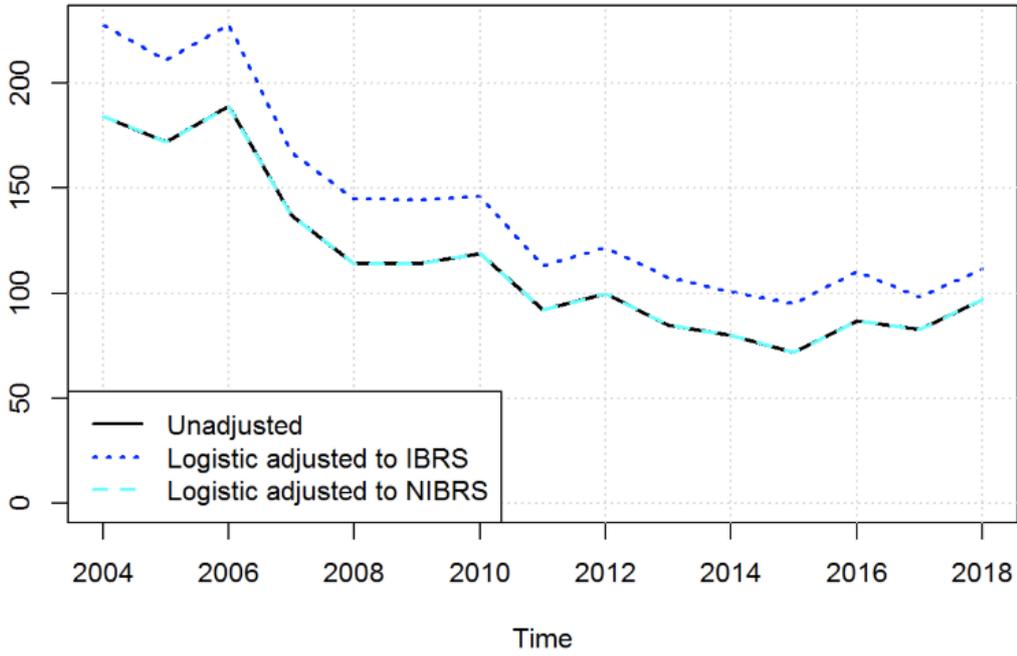


Figure 37: Unadjusted and adjusted serious injuries for Fife Police

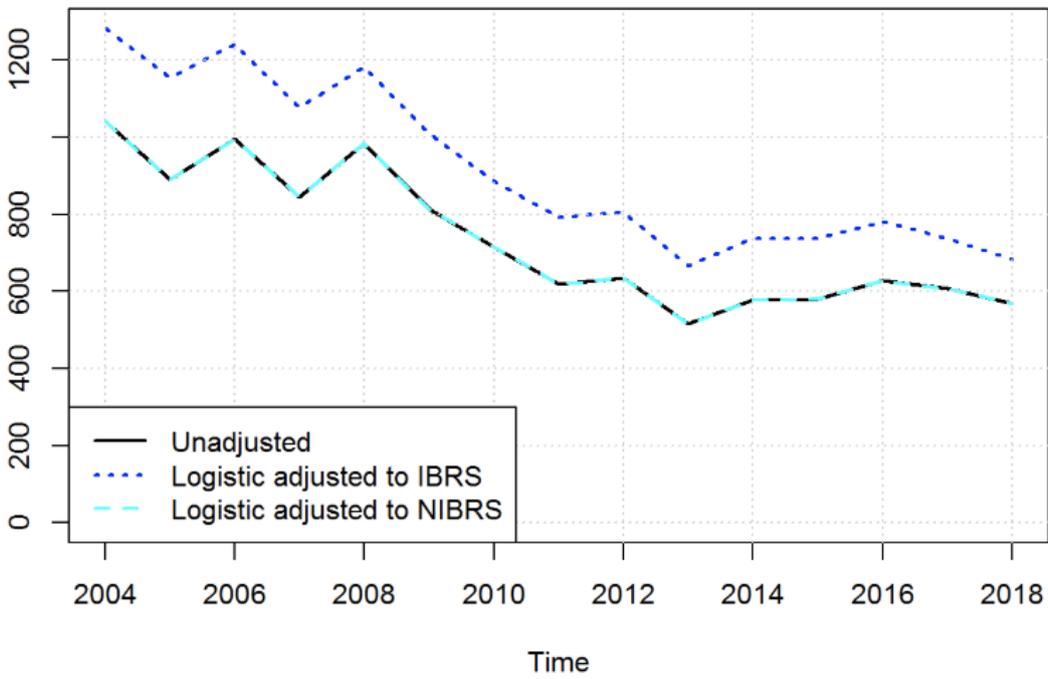


Figure 38: Unadjusted and adjusted serious injuries for Strathclyde Police

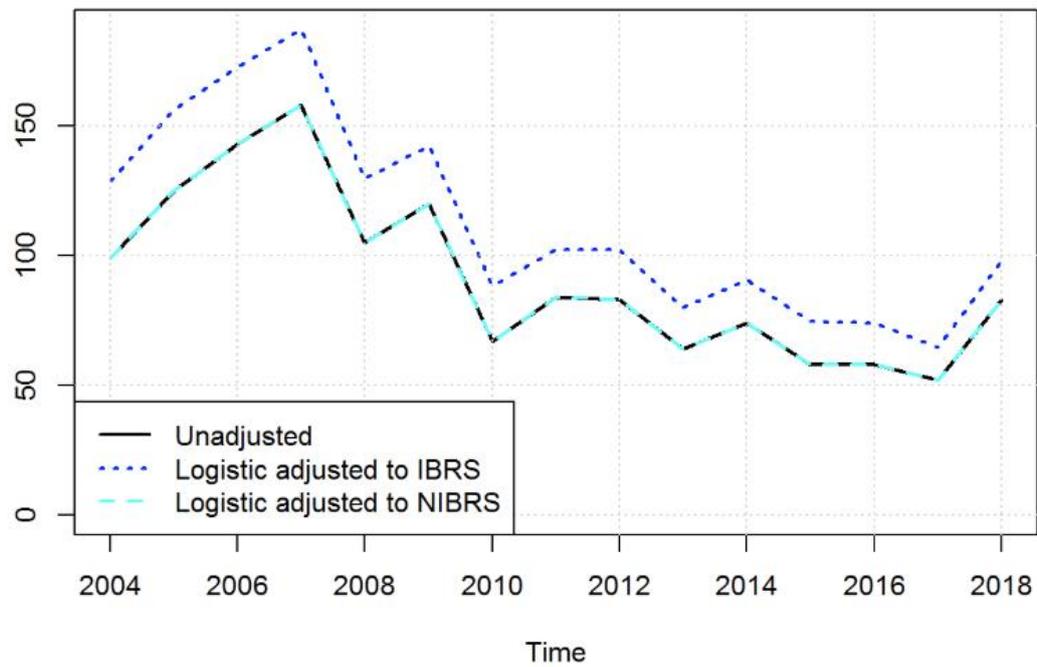


Figure 39: Unadjusted and adjusted serious injuries for Dumfries and Galloway Police

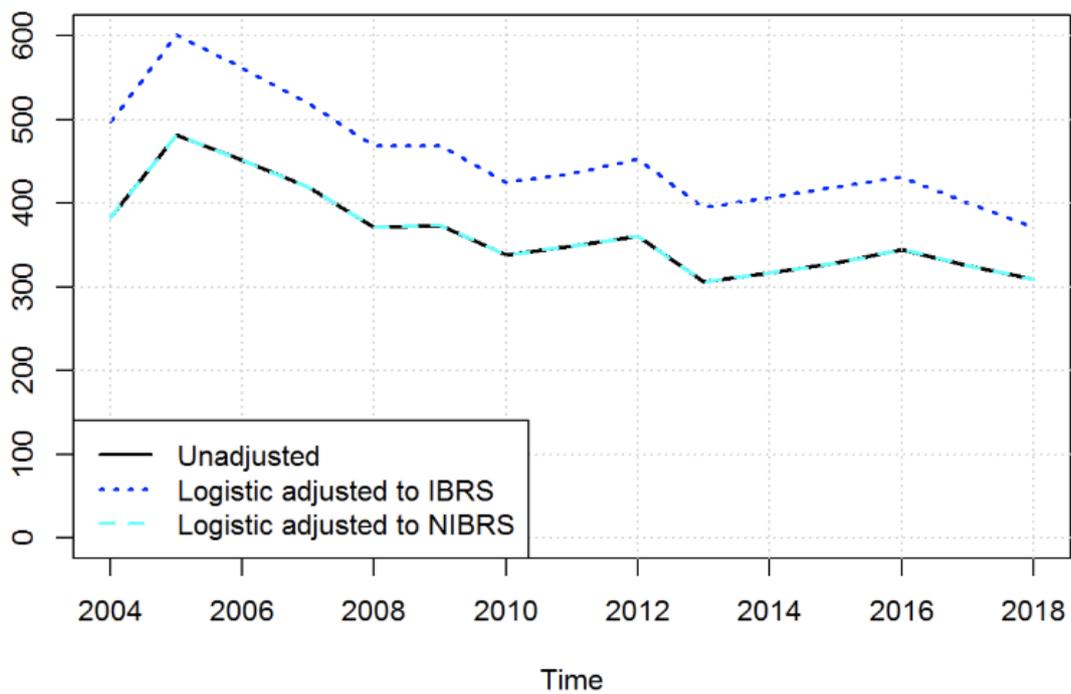


Figure 40: Unadjusted and adjusted serious injuries for Lothian and Borders Police

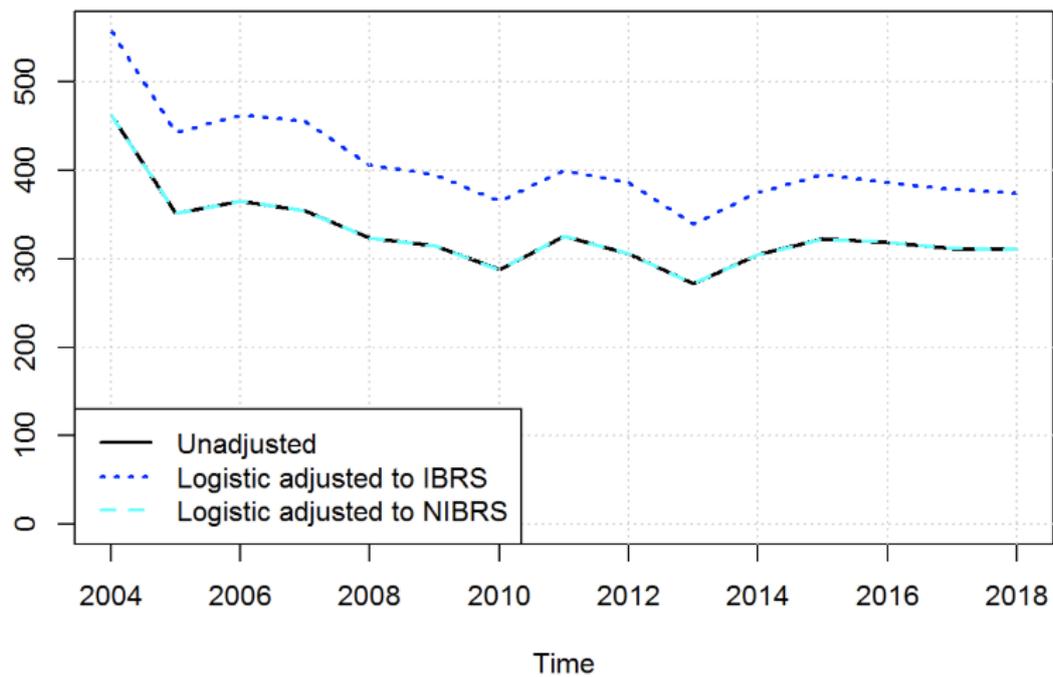


Figure 41: Unadjusted and adjusted serious injuries for Dyfed-Powys Police

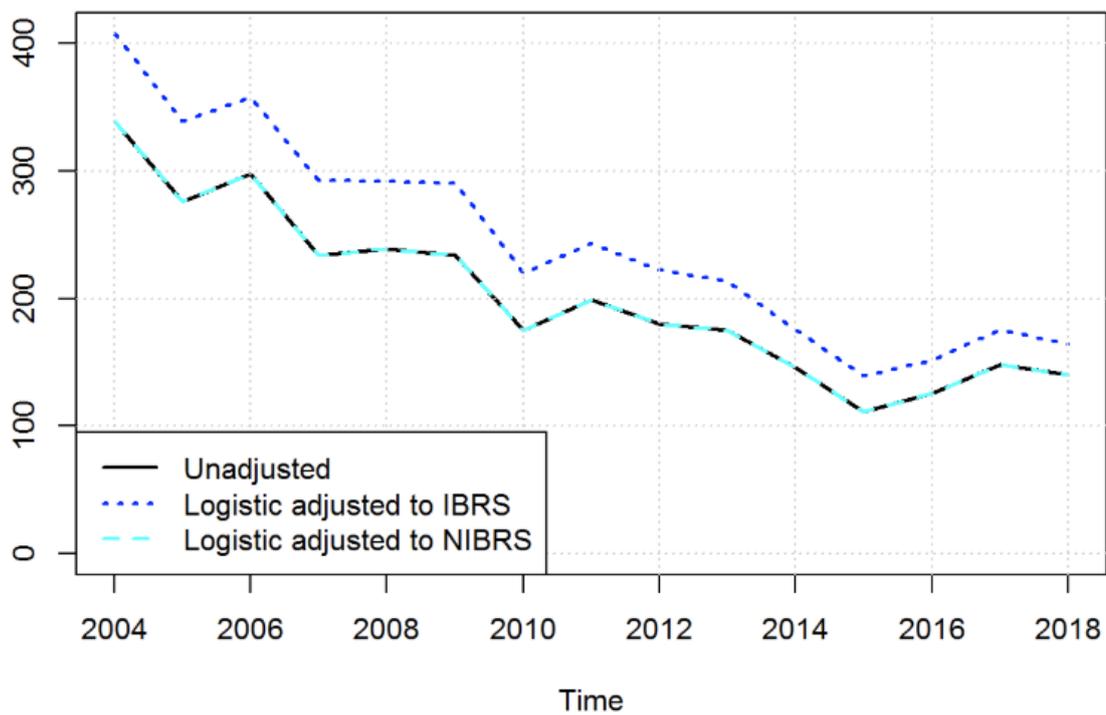


Figure 42: Unadjusted and adjusted serious injuries for Tayside Police

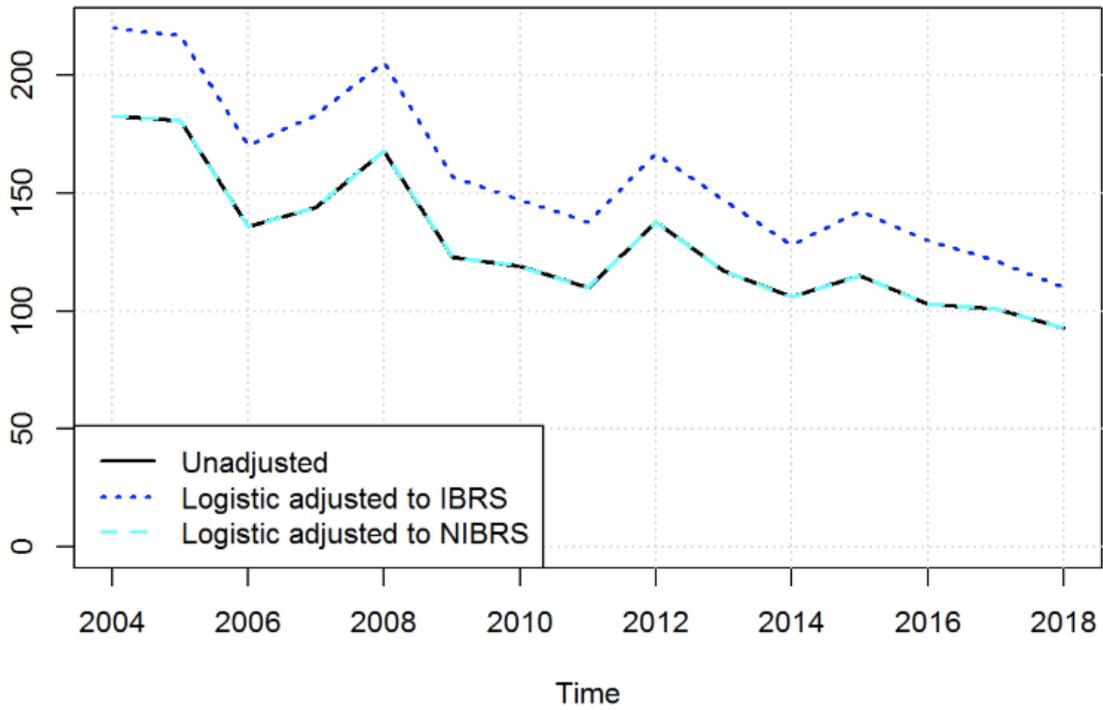


Figure 43: Unadjusted and adjusted serious injuries for Central Police

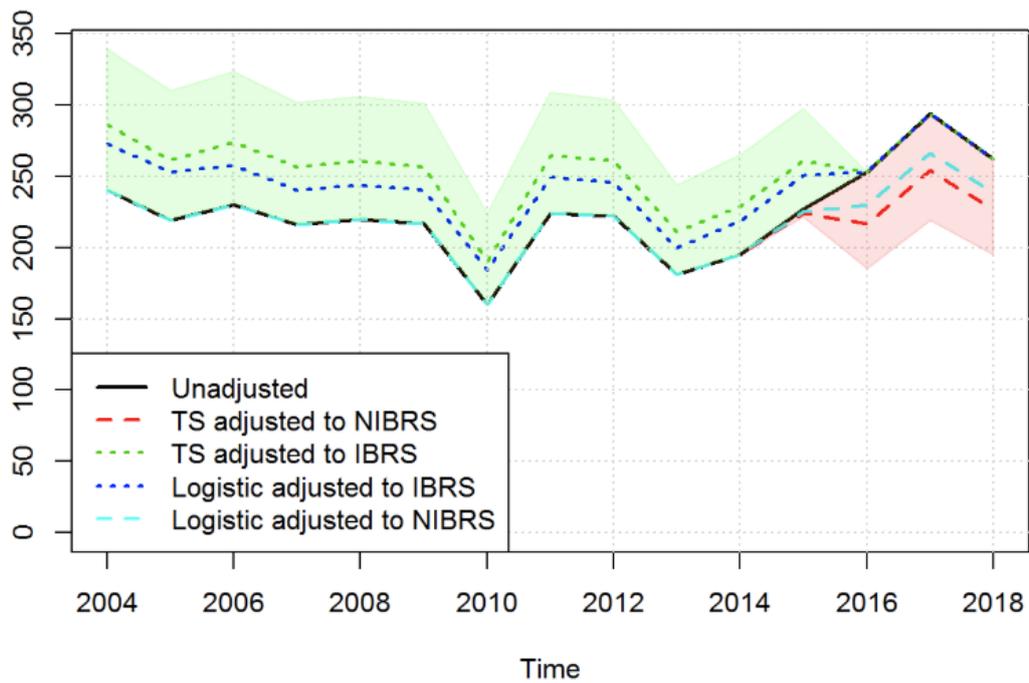


Figure 44: Unadjusted and adjusted serious injuries for Gloucestershire Police

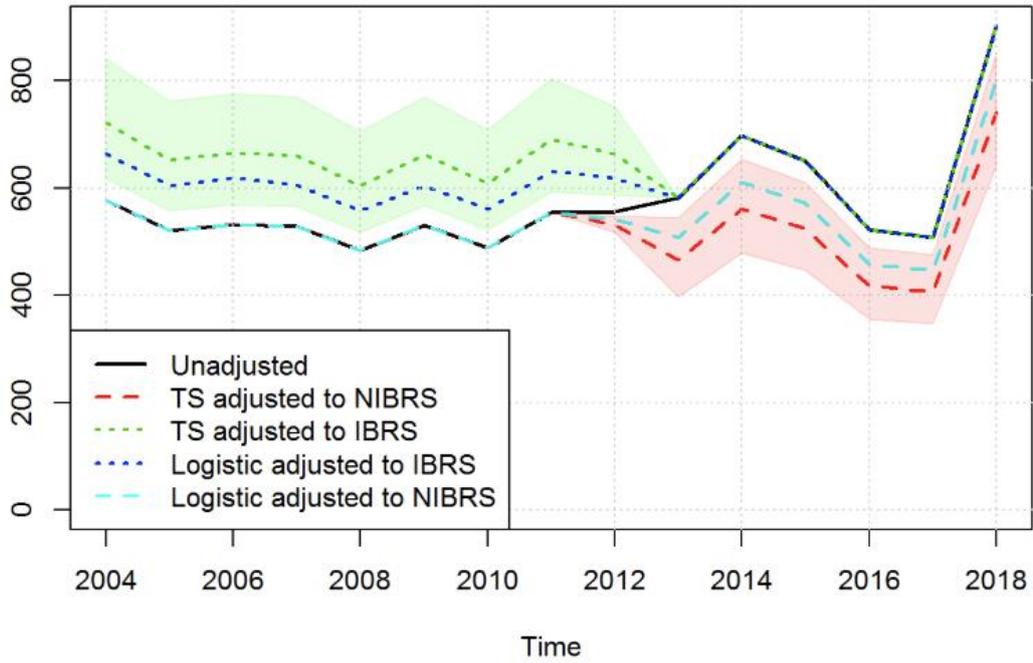


Figure 45: Unadjusted and adjusted serious injuries for Surrey Police

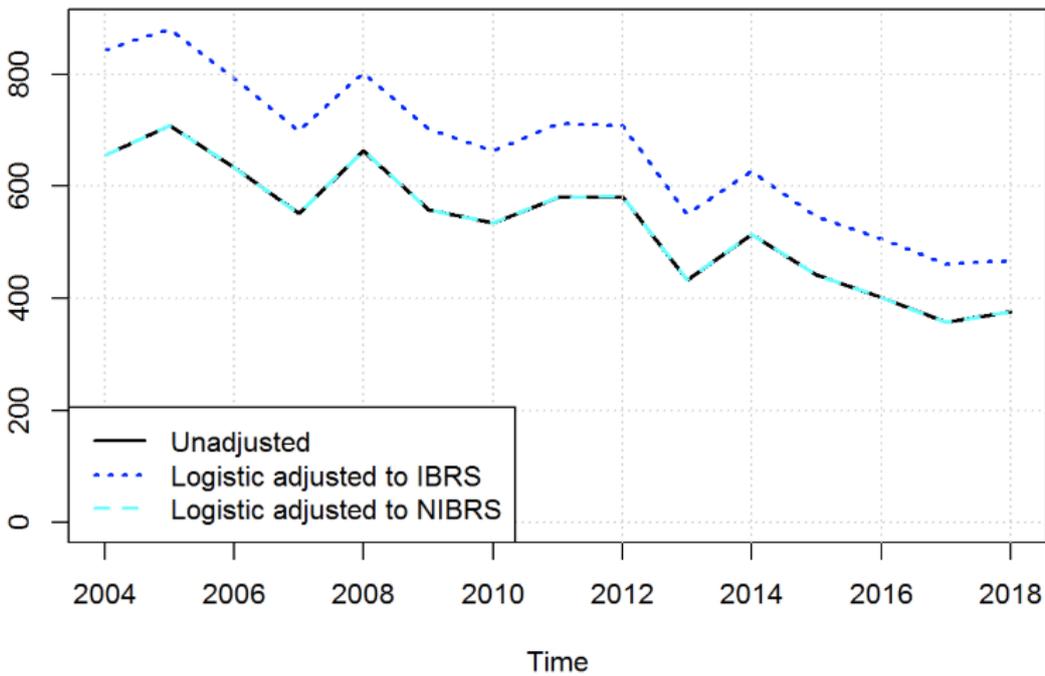


Figure 46: Unadjusted and adjusted serious injuries for Cheshire Police

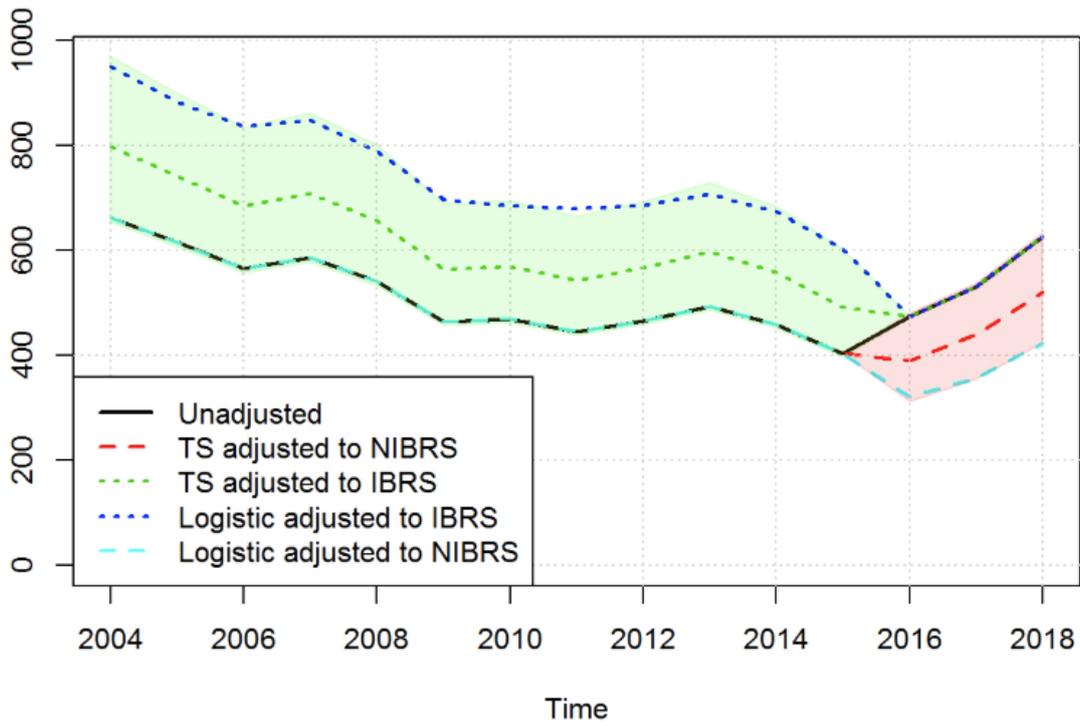


Figure 47: Unadjusted and adjusted serious injuries for Humberside Police

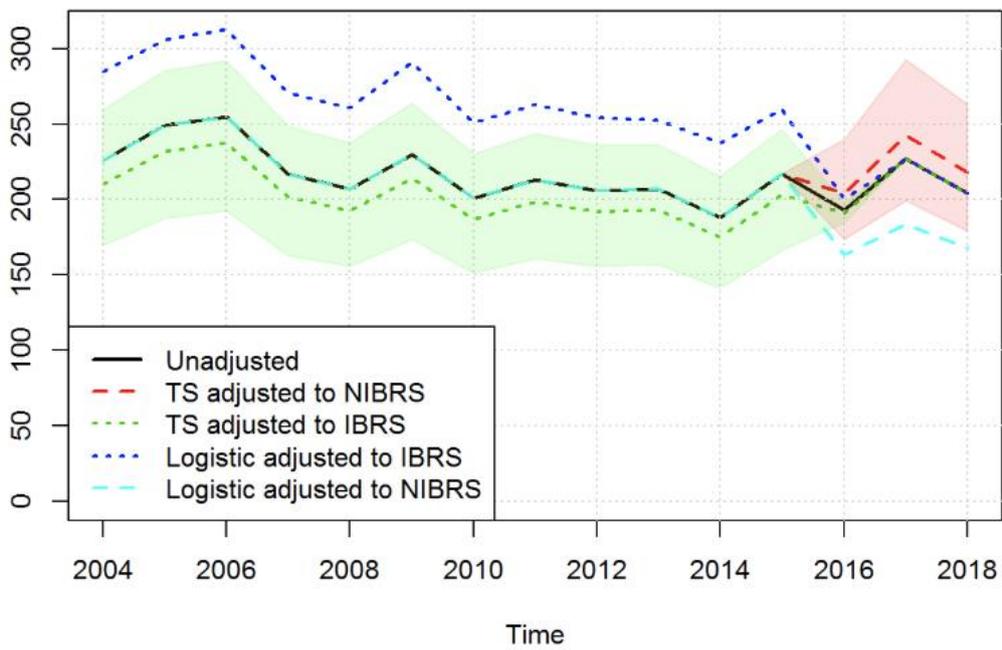


Figure 48: Unadjusted and adjusted serious injuries for Durham Police

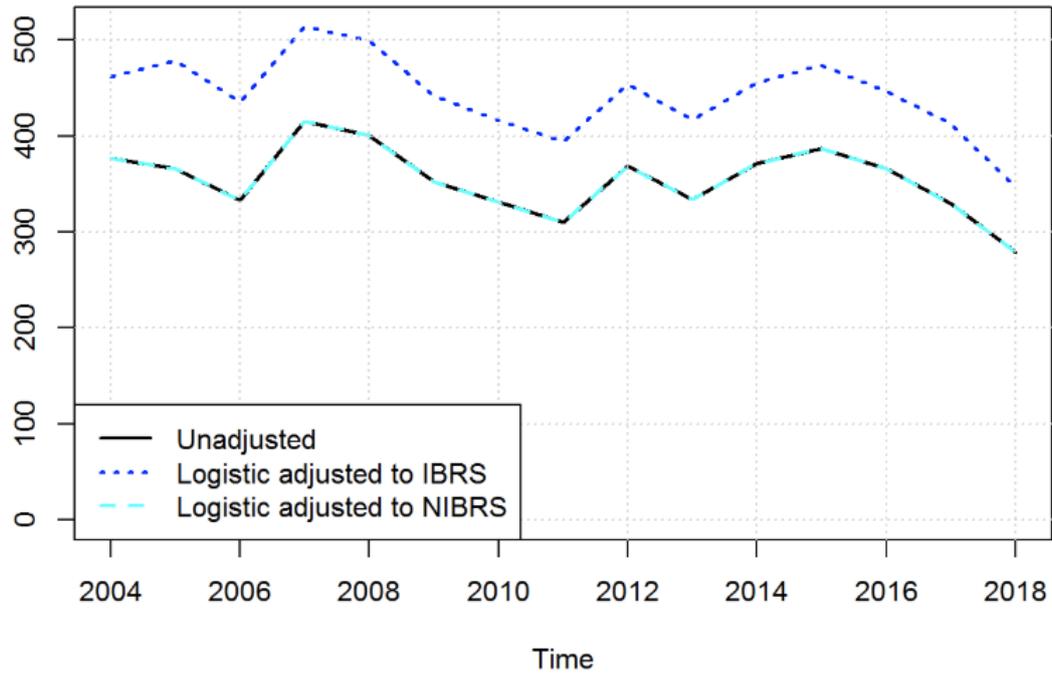


Figure 49: Unadjusted and adjusted serious injuries for Dorset Police

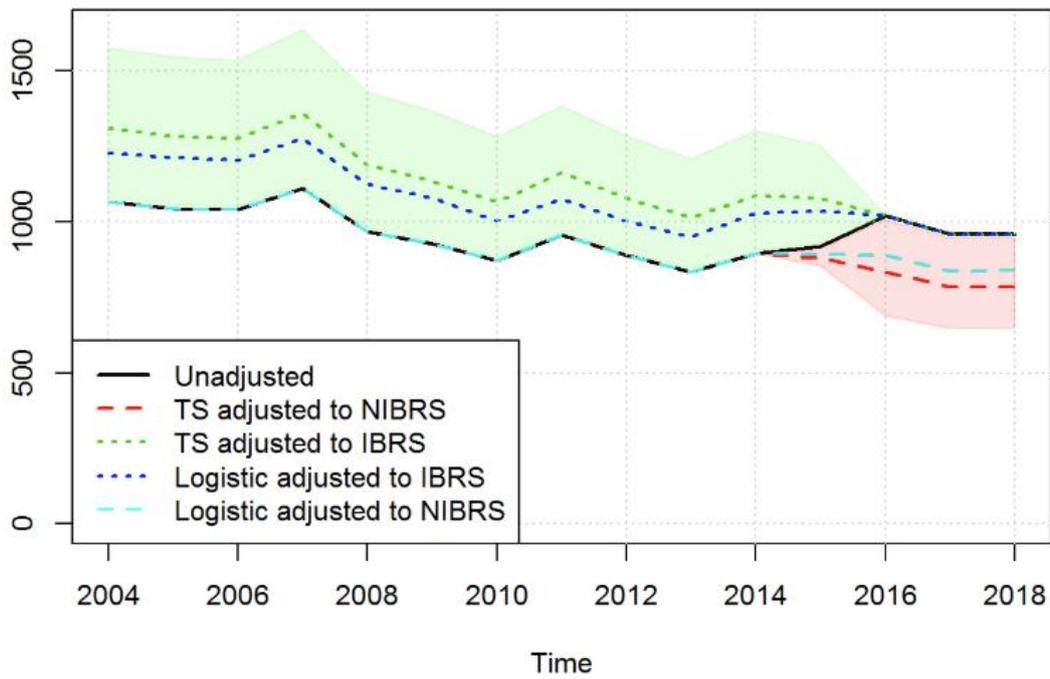


Figure 50: Unadjusted and adjusted serious injuries for West Midlands Police

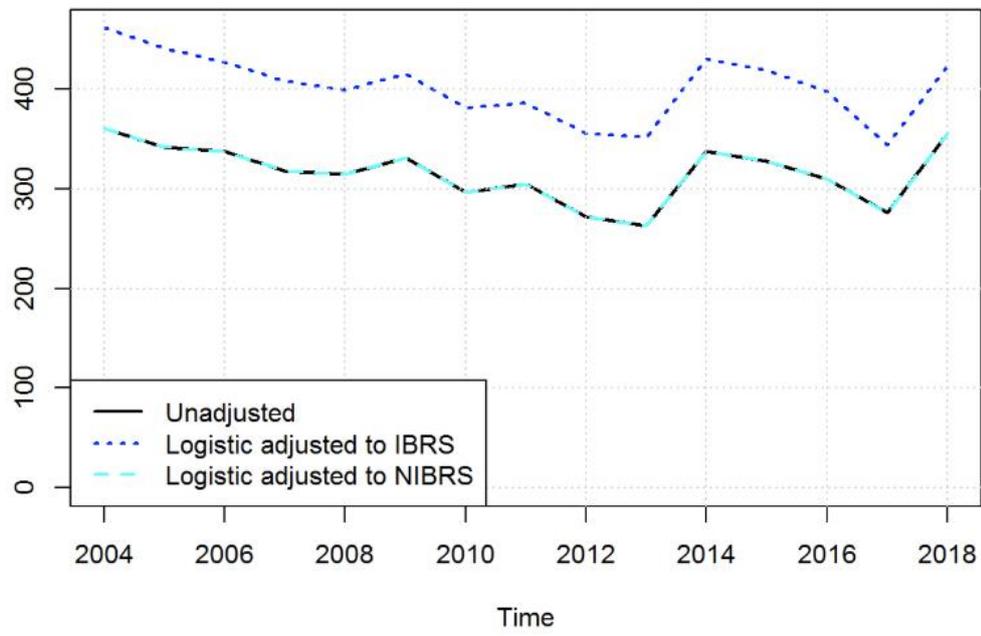


Figure 51: Unadjusted and adjusted serious injuries for Leicestershire Police