Investigation into the Complex Time Period Reporting

One of the key requirements is to enable the ability to display various complex date periods on the line chart and data tables. Currently, in next generation fingertip POC , we are only displaying the data for calendar years only, and some of it is being displayed incorrectly, ignoring the indicators "year type".

The fingertips current website, uses this various year types to compute and display the period label.

Reporting Year Types

These are the different time period formats currently in use:

Year Type	Indicator ID	Period Format	Frequency	TBC
Calendar				
Financial	20401	e.g 1998, 1999, 2000,...	1yr	
Academic	91871	e.g 2022/23, 2024/2025	1yr	
Academic	92033	e.g 2009/10 - 13/14,...	5yrs	
Financial Rolling Year – Quarterly	91041	2023/24 Q3	Quarterly	
Calendar Rolling – Quarterly				
Calendar Rolling Year – Monthly				
Financial Single Year – Cumulative Quarters				
August–July	92860	2015, 2016 ... e.t.c	1yr	yes
March–February				
Financial Multi-Year – Cumulative Quarters	91112	2020/21 Q1 - 2020/21 Q2	Quarterly	
October–September				
Financial Rolling Year – Monthly				
July–June		e.g Jul 2009 - Jun 2010, Jul 2010 - Jun 2011	1yr	
November–November	93015	2015/16, 2017/18	1yr	
Financial Year Endpoint	93468	e.g 1998, 1999,...	Annual	

This spike is to find the approaches appropriate we have to take to be able to support this complex year reporting types, that can be discussed with the team.

Goals

The goal is to propose how to handle the following:

- Required database changes
- Whether the Time Period should be treated as its own dimension
- Whether API changes are required
- Frontend changes required, including:
    - Handling different time periods in the Highcharts line chart (currently, years are treated as integers on the x-axis)
    - Ensuring sorting still works in various areas
    - How to display the period type
- Agreement on which types of date periods should be supported for **FingertipsNext**
- Documentation of proposed options (and ideally a recommendation) in Confluence

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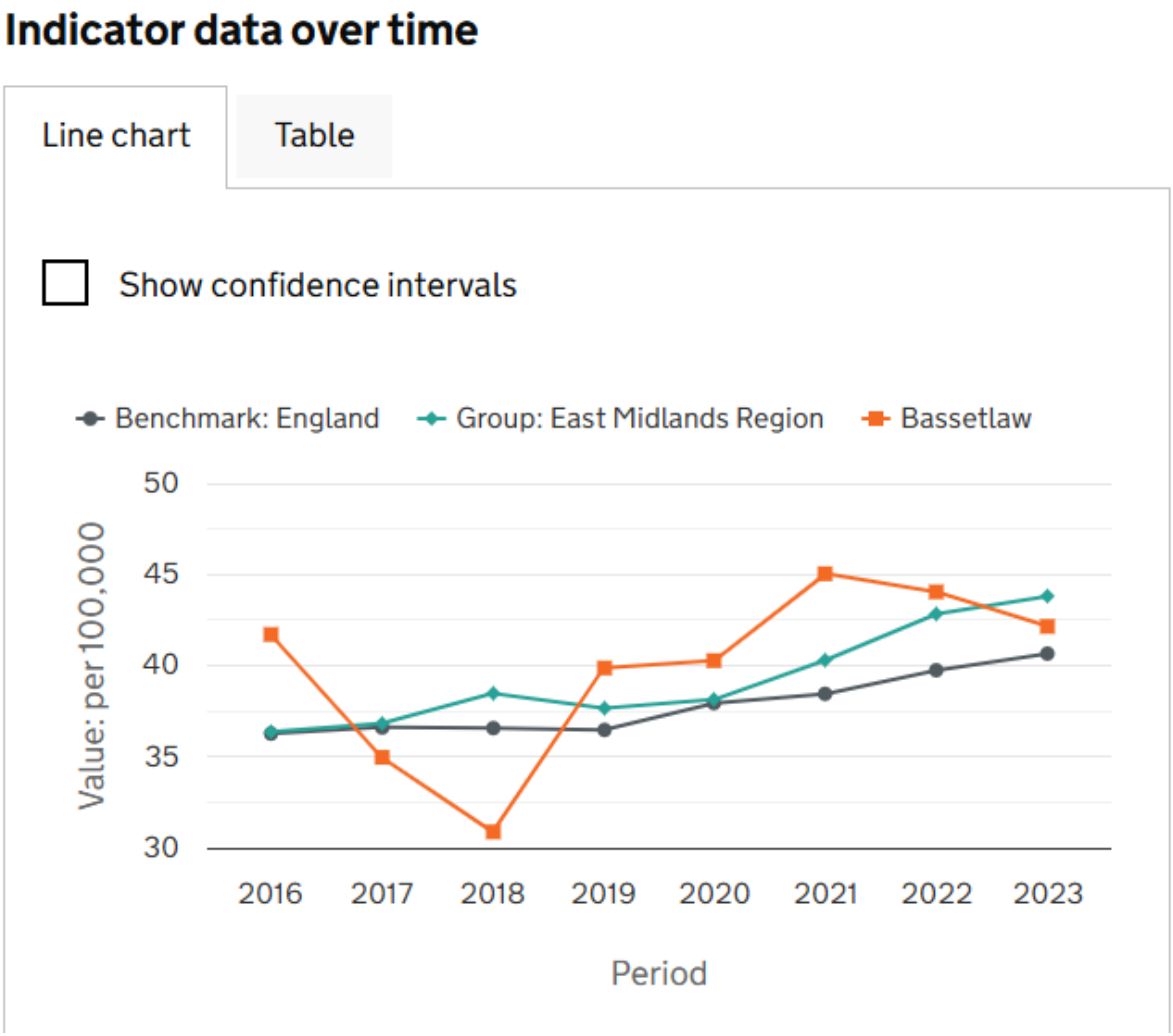
Problem Overview

- As a user I want to be able to see different period labels base on the indicator on the charts and on data tables.

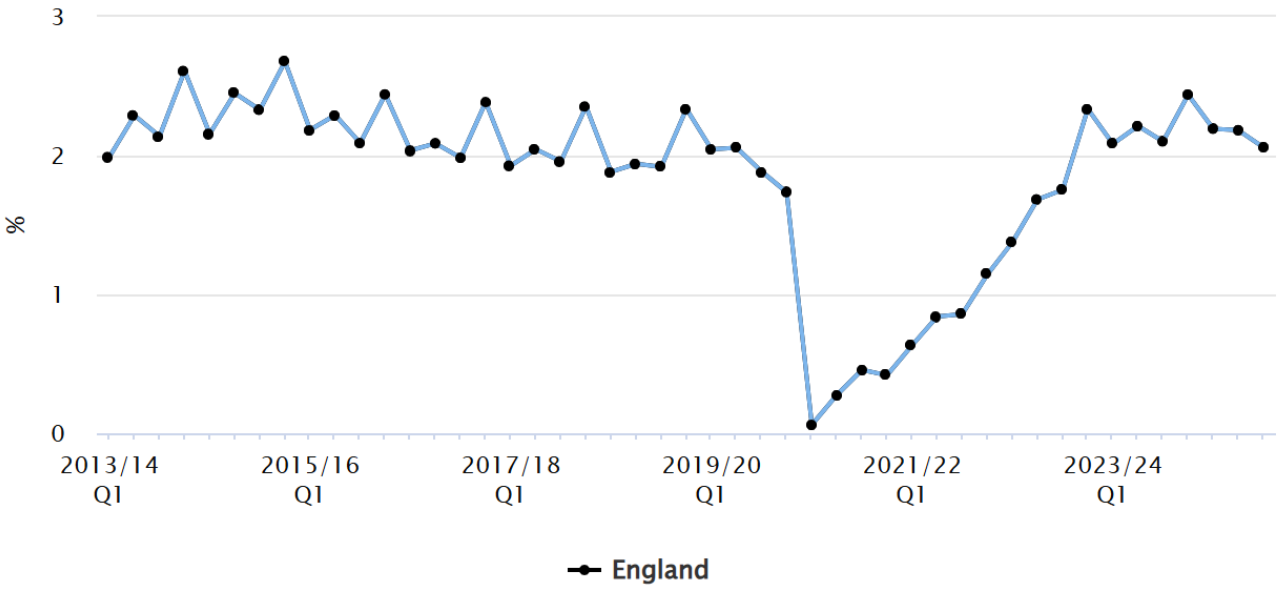
At the moment , we are plotting the y-values to the x-values (year as the period label) as shown below.

Current Chart



However, want we want is to make the chart period more dynamic, in this way we can accommodate different year types and the appropriate ticks on chart labels.

An example will be:



Proposed Solutions

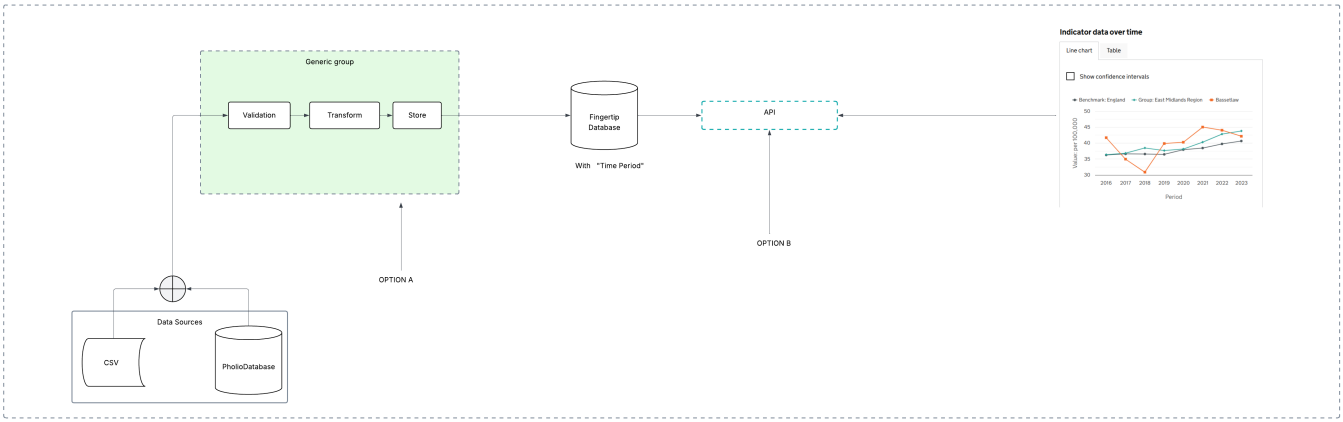
Below is a list of the proposed solutions and the modules that would be affected if any of them is accepted.

Require Module Changes

Component Name	Descriptions	Change Required
DataCreator	Ingestion Module , we need to add new fields e.g TimePeriod , YearType	Yes
Database	The HealthMeasure point table will have to change to accommodate new types	Yes
Frontend	Any frontend component that is using year on a chart has to change to use the PeriodLabel instead	Yes
Backend API	Allow for new fields to be returned	Yes
HighChart	Advance configuration on Highchart to allow tick labels on the charts to avoid stacking	Yes

Solution A (Recommended)

In this option A, I propose precomputing the "Time Period" fields during data ingestion into the current Fingertips database.



Database Creator

Currently, the database creator serves as a temporary data ingestion module for the next-generation database. The proposed solution suggests performing all period label computations within this module—if they are missing—prior to ingesting the timePeriod label into the Fingertips database, along with the year, as is currently being done.

Require fields need to compute the labels are shown below

Field	Type	Description	Required
Indicator.yearType	string	Used to identify the indicator	Yes
Indicator.Frequency	string	The name of the indicator	Yes

Field	Type	Description	Required
Time Period	string	The data point period label or period of collection	Optional
HealthData	struct		
HealthData.TimePeriodSortable	int	Contains the year, and the quarterly report it was reported e.g 20100000	Yes
HealthData.TimePeriodRange	string	Reporting period range. For calendar years we have `1yr`; for financial, quarterly, etc , optional if we have the frequency	Optional

If we are doing the pre-calculation in the Data Creator , we don't really need to export all the fields to our database. We create a new fields called PeriodLabel which the out of the pre-computation can be exported.

```
// File: DataCreator/DataCreator/DataFileReader.cs
var indicatorData = new HealthMeasureEntity
{
    IndicatorId = indicatorId,
    TimePeriod = timePeriod,
    ...
};
allData.Add(indicatorData);
```

The Expected Output

- `PeriodLabel`: the displayable labels for the data points

Database Schema Changes

The only important changes here is adding a new field on the HealthMeasure Table.

```
CREATE TABLE [dbo].[HealthMeasure](
   [HealthMeasureKey] [int] IDENTITY(1,1) NOT NULL,
   [PeriodLabel] NVARCHAR(30)  NOT NULL,
   ...
)
```

API Endpoint Changes

Adding a new PeriodLabel to the HealthDataPoint

```
export interface HealthDataPoint {
    periodLabel: string,
```

```
    ...
}
```

Solution B

Solution B is similar to Solution A; however, instead of performing the period label pre-calculation in the DataCreator module before ingestion, we can ingest the required fields and recalculate the period labels either at the API level or on the frontend before displaying them.

Database Changes

We need to track the new fields at the database level to enable recalculation in case they are missing or stored in an incorrect format.

Field	Type	Source	Destination
Indicator.yearType	string	Pholio Database	fingertips.IndicationDimension
Time Period Sortable	string	CSV Database	fingertips.HealthMeasure
PeriodLabel	string	Calculated Field	fingertips.HealthMeasure
Time Period Range	string	CSV Database	fingertips.IndicationDimension

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After porting this fields to the next generation database the same calculations for the period label has to be carryout and the period label has to be updated.

Optional C

Do nothing at all

Investigation of the Frontend: Highcharts Changes

Currently, the frontend only displays years on the x-axis without labels. Instead, what we want is the ability to display **custom labels** (e.g., "Q1 2010", "Q2 2015") alongside the tick marks. This will allow us to represent different time ranges on the x-axis of the Highcharts chart.

Challenges

- How do we display **custom labels** instead of relying solely on year values?
- Since the chart is a **multi-series line chart**, we want the actual **x-values to correspond to years**, not the label index. That means the value-to-year mapping should still be done based on the tick index, even though the label may show something different.

Using Highcharts `categories`

Our current line chart contains multiple series. If we rely solely on `categories` for the x-axis, the chart will plot data points based on the **position in the category array**, which can lead to incorrect plotting when series have data for different years.

Example:

```
Series A = [2010, 8.35], [2015, 9.0]
Series B = [2010, 7.35], [2017, 4.0]
```

We might compute the categories as:

```
Categories C = [2010, 2015, 2017]
```

However, Highcharts will plot the data like this:

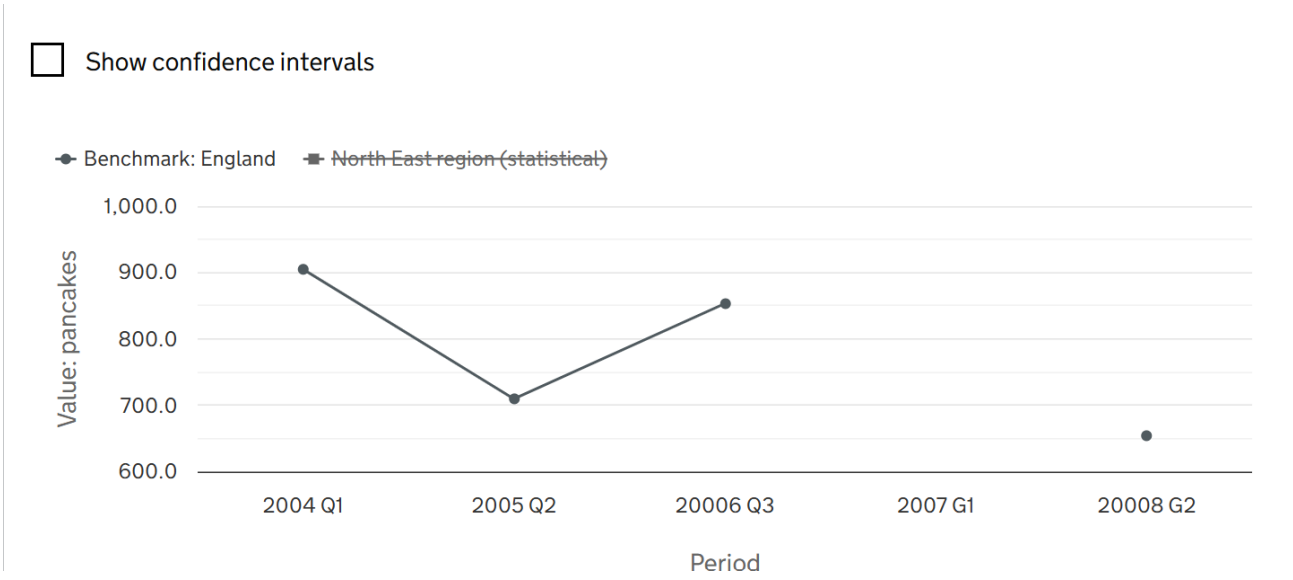
- Series A:
  - Point 1 = C[0], A[0] → 2010, 8.35
  - Point 2 = C[1], A[1] → 2015, 9.0
- Series B:
  - Point 1 = C[0], B[0] → 2010, 7.35
  - Point 2 = C[1], B[1] → 2017, 4.0 ❌ (wrong mapping!)

This results in an incorrect chart because Highcharts aligns points **by index**, not by year.

Solution A: Use `connectNulls`

We can precompute all the time points across all series and generate aligned arrays. For time points where a series has no data, we insert `null`.

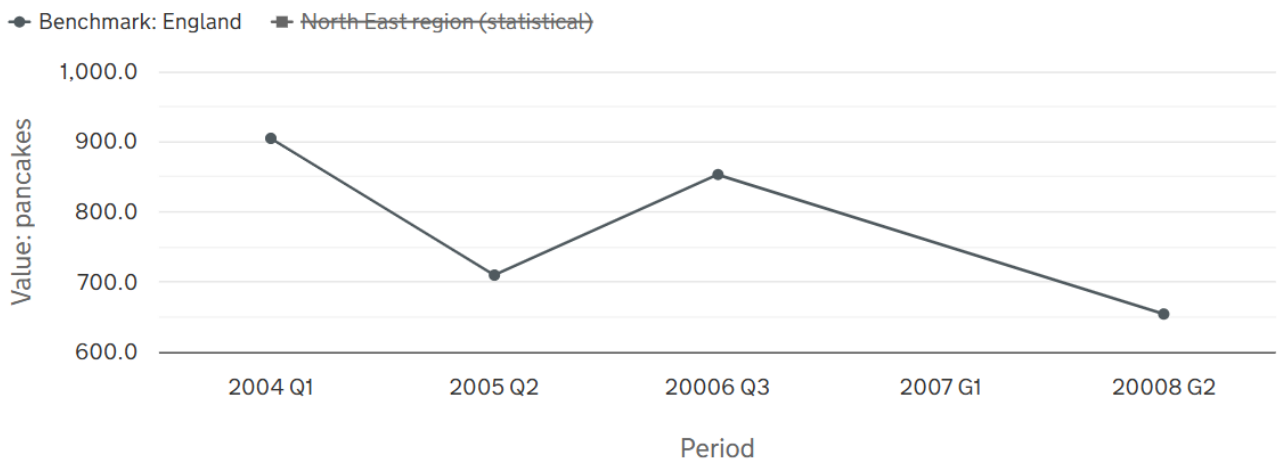
This approach breaks the lines by default, producing a broken chart like this:



Fix:

We can enable Highcharts to **connect the data points even if `null` values exist** using the `connectNulls` setting:

```
plotOptions: {
  series: {
    animation: false,
    connectNulls: true
  },
}
```



With this, the chart will connect data points seamlessly, preserving the line even with missing data. Now, we can use **label-based periods** on the x-axis without breaking the line.

Final Steps

1. Extract and sort **all unique label periods** from all series.
2. If a label period does not exist in a particular series, insert `null` at that index.
3. Configure Highcharts to use `categories` (i.e., the label periods) instead of direct `x, y` data.

Label Period Computations

Still coming...

Suggested Technical Tickets

This can be broken down into three tasks:

- **Ingestion Task**: Precompute the period labels during data ingestion & creating the database schema needed.
- **Backend Task**: Update the endpoint and database sql query to include period labels in the returned health points.
- **Frontend Task**: Apply advanced Highcharts configuration and refactor existing components to support the new period label instead of year.

Conclusion

All data periods should be supported, and the recommended scalable approach is Option A, which allows these data periods to be precomputed before being ingested into the database.