



# **South Wales Metro - Rapid Health Impact Assessment**

8 December 2017



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# 1 Introduction

## 1.1 Introduction

This document assesses the health impacts of Phase 2 and Phase 3 of the South Wales integrated metro system. The two phases comprise of multiple schemes to improve the network including new stations, electrification of rail, increased routes and improvements to the bus network. A long list of potential schemes has been drawn up. At this stage the schemes are subject to refinement and shortlisting. Consequently a “rapid” Health Impact Assessment (HIA) has been carried out.

The report presents the existing health and socio economic conditions in the South Wales region for each of the local authorities that will be directly affected by the development. It also presents the findings of desk based research into the determinants of health that are relevant to the scope of the South Wales integrated metro system. The main potential health impacts on local residents and the Metro users are identified and summarised in a matrix.

## 1.2 HIA legislation and guidance

HIA is not a statutory requirement in Wales but it is regarded by the Welsh Government as a best practice approach to assessing health and wellbeing of policies and projects. Although it is not a statutory requirement, HIA forms part of the Welsh Transport Planning and Appraisal Guidance (WelTAG<sup>1</sup>) (although no set procedure for conducting an assessment is prescribed). Guidance on carrying out HIA in Wales is provided by the Welsh Health Impact Assessment Support Unit in their Practical Guide<sup>2</sup>.

The guidance provided by the Welsh Health Impact Assessment Support Unit is the most comprehensive guidance on HIA for Wales and has been followed for the assessment of the South Wales Metro Phase 2 and Phase 3. The guidance sets out a five step process:

- STEP 1: Screening – deciding whether to undertake a HIA
- STEP 2: Scoping – determining the focus, methods and work plan
- STEP 3: Appraisal of evidence – identifying the health impacts
- STEP 4: Reporting and recommendations
- STEP 5: Monitoring and evaluation

There are three types of HIA which can be carried out depending upon the scale and stage of a project. These are:

- **A desktop HIA:** This is a short one day exercise which is likely to include a small number of stakeholders identifying impacts using existing knowledge and evidence to make an assessment.
- **A rapid HIA:** This is normally undertaken over a period of several weeks – it typically involves a brief investigation of health impacts, including a short literature review of quantitative and qualitative evidence and the gathering of knowledge.

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<sup>1</sup> Welsh Government (2014) WelTAG

<sup>2</sup> Welsh Health Impact Assessment Support Unit (2012) Health Impact Assessment: A Practical Guide

- **A comprehensive HIA:** This is a more in-depth assessment applied to detailed development proposals or a completed project and therefore requires more time to complete. This may require extensive literature searches and the collection of primary data.

A rapid HIA has been prepared at this stage as the South Wales Metro Phases 2 and 3 currently comprise a list of 33 scheme options.

### 1.3 Structure of the report

The report is structured as follows:

- Chapter 1 (this chapter) provides an introduction to the rapid health impact assessment
- Chapter 2 presents an overview of the scheme
- Chapter 3 presents an assessment of the health impacts which includes a brief overview of the method used, and the health impacts matrix.

Further details on the assessment are provided in the appendices:

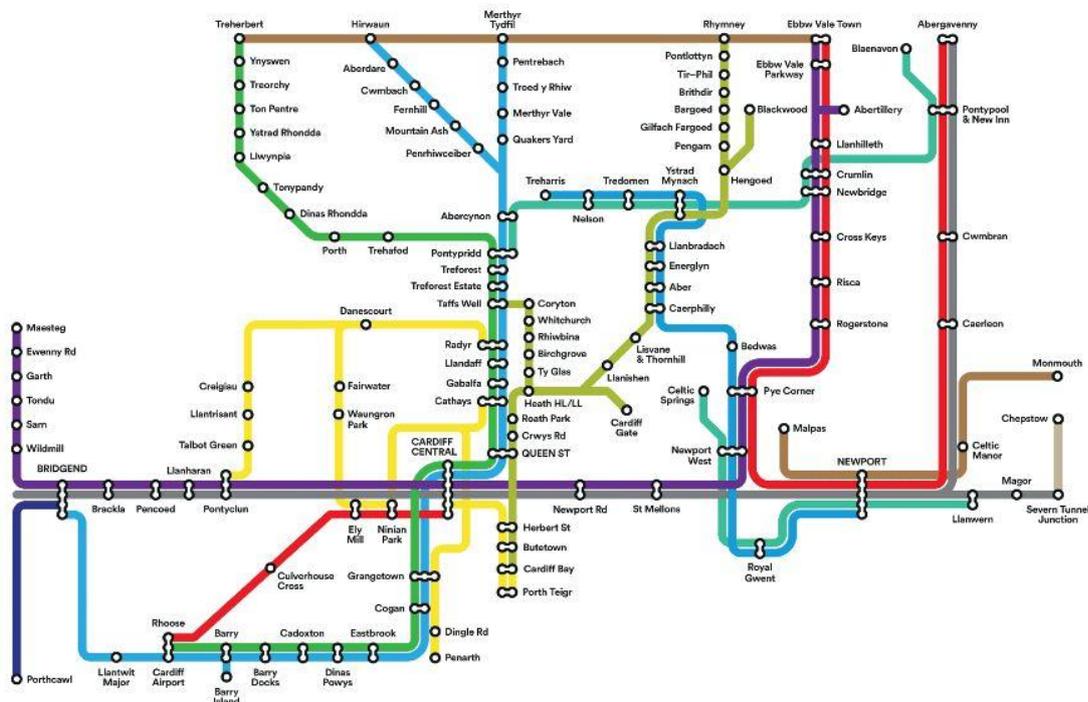
- Appendix A presents the methodology that was applied
- Appendix B presents the screening and scoping stage impacts that were considered
- Appendix C is a baseline of key socio-economic and health indicators
- Appendix D is a summary of the evidence review of the impacts of rail schemes on health.

## 2 Overview of the South Wales Metro

The vision for the Metro is:

*'a new transport system that will transform the way we travel around South Wales. It will provide faster, more frequent and joined-up services using trains, buses, and light rail. Metro will bring benefits to passengers, link communities together, and help transform the economy. It will have a positive social, economic, and environmental effect. It will also shape our region's identity'.*

Figure 1: Proposed extent of the South Wales Metro System



Source: Welsh Government

The South Wales Metro will be delivered in several phases. The phases and proposed interventions are listed below. Phase 1 has already been delivered and does not form part of this HIA. Phases 2 and 3 currently comprise 33 schemes and will include some, or all, of these elements:

- An electrified rail system;
- Integrated transport hubs;
- Park-and-ride facilities;
- New (including some on-street) light rail and/or bus rapid transit routes;
- Better integration of services across modes and operators; and
- Active travel interventions.

Enhanced services on the Valley Lines are an important part of the project. This scope of Metro includes all the lines in and north of Cardiff, the Vale of Glamorgan line, the Ebbw Valley and Maesteg branches, the Marches line to Abergavenny and the South Wales mainline.

**Phase 1 (already delivered):**

- Pye station corner;
- Rail and bus stations improvements;
- Bus corridor schemes on A470; and
- Active travel park and ride schemes.

**Phase 2:**

- Rhymney, Coryton and Cardiff Bay line enhancements;
- Treherbert, Aberdare and Merthyr line enhancements;
- Extra stations and conversion of sections of freight lines;
- Enhanced intermodal facilities and associated station improvements; and
- Ebbw Valley Line improvements and spur to Abertillery.

**Phase 3:**

- Newport Rapid Transit;
- Enhancements to Maesteg and Vale of Glamorgan lines.
- On-street operations in Cardiff City Centre;
- Extension of the Cardiff Bay branch;
- Direct link from Cardiff Bay to Cardiff Central;
- Capacity improvements on Vale of Glamorgan line;
- Capacity improvements at Cardiff Central;
- Heavy rail stations (if not delivered in Phase 2);
- Corridor from Central Cardiff to North West Cardiff development areas;
- Central Cardiff to North East and East Cardiff development areas;
- Caerphilly to Newport;
- Hengoed to Blackwood;
- Coryton to Taffs Well;
- Heads of Valleys and Pontypridd – Pontypool BRT Schemes; and
- Other schemes which may emerge.

## 3 Assessment of health impacts

This section provides an overview of the method for the HIA which is based on the Wales Health Impact Assessment Support Unit guidance, as set out in Appendix A. It then addresses the key health impacts that have been identified. The impacts for each of the schemes has been presented in an impacts matrix.

### 3.1 Approach to assessing health impacts

The screening stage was carried out to confirm that the scheme had the potential to generate health impacts and identify what appropriate level of assessment was required for this scheme. This screening stage also included an assessment as to any potential impacts likely to be realised.

The scoping stage involved further consideration of the potential impacts. The outcome of this stage was a summary of the potential impacts that would be included in the Rapid HIA (Appendix B), supported by socio-demographic information and health indicators (Appendix C) and a review of the main scientific evidence and literature on the health determinants that are relevant to construction and operation of the South Wales Metro scheme (Appendix D).

A rapid HIA was then conducted and the impacts of the scheme options presented in an impacts matrix. The schemes have been grouped based on location and type of scheme. The groupings are consistent with those used in the Strategic Environmental Assessment. A short description of each of the groupings is provided in the matrix.

### 3.2 Key health impacts

This rapid HIA focuses on the following health determinants which are considered to be the most relevant to this stage of assessment:

#### The environment:

- Air quality; and
- Noise

#### Physical infrastructure:

- Community severance;
- Housing demolition; and
- Traveller stress (accessibility to the infrastructure, access to services and healthcare).

#### Socio-economic conditions:

- Generation of employment; and
- Lifestyle (physical activity, access to green space).

Table 1 sets out how each of the scheme groupings could influence these health determinants. The following chapter sets out the conclusions and recommendations.

**Table 1 Health Impact Matrix**

Option	Description	Potential health impact	Temp / perm	Health					
				Construction / operation	Benefit / adverse	Health determinant	Intensity of impact	Extent of impact	Vulnerable groups
<b>Do Nothing (No change from current running options)</b>	No changes to the South Wales Metro network.	Restricted access to infrastructure will remain. Restricted access can reduce access to employment, social infrastructure, education and social networks which are all linked to good health and wellbeing.	Permanent	Operation	Adverse	Physical infrastructure	Low	High	Children, disabled people, older people, people with pushchairs / prams
<b>Rhymney Package Scheme 1-Light Rail Conversion Cardiff Queen Street to Cardiff to Rhymney. Scheme 8: Light Rail conversion Ystrad Mynach to Trelewis Schemes 12 and 13: Light Rail Station Wedal Road and Crwys Road. Scheme 166: Park and Ride Cardiff Gate</b>	Essentially electrification in the form of Light rail and Heavy rail. Likely to involve installation of gantries, signal alteration, works to bridges and tunnels, replacement of rolling stock. New stations along existing and Park and ride at Cardiff Gate near to existing business park.	Introduction of electrification will help to improve air quality. General improvements in air quality will help reduce the incidence of respiratory and cardiovascular disease.	Permanent	Operation	Benefit	Environment	Low	Low	Children, older people, disabled people (those with a LLTI) and pregnant women
		Improved routes or new routes could generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network has been shown to be linked to improved health and wellbeing outcomes.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, disabled people, older people, people with pushchairs / prams
		Construction activities generating noise, which can cause annoyance to those living nearby. It is also assumed that no night time working will be taking place.	Temporary	Construction	Adverse	Environment	Low	Low	Children, older people and pregnant women
<b>MTA Lines Package Scheme 26: Light Rail Conversion of existing Heavy Rail lines, Cardiff Queen Street to Merthyr / Treherbert / Aberdare</b>	Essentially electrification in the form of Light rail and Heavy rail. Likely to involve installation of gantries, signal alteration, works to bridges and tunnels, replacement of rolling stock	Use of both light and heavy rail technology will help to improve air quality, as new rolling stock is likely to lower emissions. General improvements in air quality will help reduce the incidence of respiratory and cardiovascular disease.	Permanent	Operation	Benefit	Environment	Low	Low	Children, older people, disabled people (those with a LLTI) and pregnant women
		Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, disabled people, older people, people with pushchairs / prams
		Construction activities generating noise, which can cause annoyance to those living nearby. It is assumed that no night time working will be undertaken.	Temporary	Construction	Adverse	Environment	Low	Low	Children, older people and pregnant women
<b>MTA Lines Package Schemes 30 (LR station, Gabalfa) , 34 (LR station, Upper Boat), 36 (LR station, Nantgarw), 38 (LR station, Maindy), 140 (New Bus Station, Merthyr), 147 (Aberdare Bus Station Upgrade), 159 (Pontypridd Bus Station Upgrade),</b>	Construction of new light rail stations. Potentially partial demolition of bus stations and expanded facilities.	Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, disabled people, older people, people with pushchairs / prams
		Construction sites and diversions can create severance in terms of travel. Diversions are likely to be short in urban areas, but possibly longer for those living in rural areas. Some diversions may also be in place for longer periods for particular works. Severance and diversions can impede access to healthcare and other community facilities, interrupt social networks, and therefore can impact on health and wellbeing.	Temporary	Construction	Adverse	Physical infrastructure	Low	High	Children, disabled people, older people, people with pushchairs / prams, women
		Construction activities generating noise, which can cause annoyance to those living nearby. It is assumed that no night time working will be undertaken.	Temporary	Construction	Adverse	Environment	Low	Low	Children, older people and pregnant women

<p><b>Central Cardiff on Street Package.</b>                  Scheme 22: LR conversion of Cardiff Bay and Coryton Lines, Schemes 20 and 21: Extension of Cardiff Bay Line to Cardiff Central (via Dumballs Rd) and Porth Teigr (via Bute Place and Pierhead St), Scheme 16: LR station Louden Sq, Scheme 218: LR on street from Cardiff Castle to Cathays</p>	<p>Predominantly electrification, construction of one new station and also tram style on street running over a small distance.</p>	<p>Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.</p>	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, older people, disabled people (those with a LLTI) and pregnant women
		<p>Construction sites and diversions can create severance in terms of travel. Diversions are likely to be short in urban areas, but possibly longer for those living in rural areas. Some diversions may also be in place for longer periods for particular works. Severance and diversions can impede access to healthcare and other community facilities, interrupt social networks, and therefore can impact on health and wellbeing.</p>	Temporary	Construction	Adverse	Physical infrastructure	Low	High	Children, older people, disabled people (those with a LLTI) and pregnant women
<p><b>Northwest Corridor Package Schemes 53 and 229: LR spur from Creigau to Pontyclun via Llantrisant and Llantrisant to Beddau. Scheme 49: LR Station Victoria Park</b></p>	<p>Re-opening of a historic rail line with new electric light rail. New light rail station, Cardiff (Victoria Park)</p>	<p>Replacement of polluting light rail rather than the diesel rolling stock will help to prevent pollution levels from increasing with the re-opening of a new historic rail line. General improvements in air quality will help reduce the incidence of respiratory and cardiovascular disease.</p>	Permanent	Operation	Benefit	Environment	Low	Low	Children, older people, disabled people (those with a LLTI) and pregnant women
		<p>Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.</p>	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, disabled people, older people, people with pushchairs / prams, women
		<p>Increasing the likelihood of flooding could lead to negative health impacts. Experiencing a flooding event can lead to mental and psychological impacts.</p>	Permanent	Operation	Adverse	Environment	Negligible	Low	Children, older people, disabled people
<p><b>Vale of Glamorgan line package: Scheme 65 – LR spur to Sports Village in Cardiff</b>                  Scheme 67: HR Station St Athan                  Schemes 94, 120: BRT Cardiff – Barry and Cardiff – Cardiff Airport                  Scheme 226 HR diesel service enhancements Cardiff to Bridgend</p>	<p>Electrified extension of Penarth Line to Cardiff Sports Village, enhanced frequency diesels to Bridgend, with BRT schemes and one new station.                   Diesel is assumed to be lower emissions newer diesel therefore enhanced frequencies are not likely to significantly affect emissions.</p>	<p>Replacement of polluting vehicles with newer less-polluting diesel vehicles will help to improve air quality. General improvements in air quality will help reduce the incidence of respiratory and cardiovascular disease.</p>	Permanent	Operation	Benefit	Environment	Low	Low	Children, older people, disabled people (those with a LLTI) and pregnant women
		<p>Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.</p>	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, older people, disabled people (those with a LLTI) and pregnant women
<p><b>VOG Line Package – Scheme 65: LR conversion of Penarth Line with on-street running through Grangetown</b></p>	<p>Street works and gantry construction.</p>	<p>Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.</p>	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, disabled people, older people, people with pushchairs / prams, women

Bridgend Package – Scheme 110: BRT from Bridgend to Porthcawl	Road works to provide priority running (possible segregation) for buses to reduce delays due to congestion.	Replacement of polluting vehicles with newer less-polluting vehicles will help to improve air quality. General improvements in air quality will help reduce the incidence of respiratory and cardiovascular disease.	Permanent	Operation	Benefit	Environment	Low	Low	Children, older people, disabled people (those with a LLTI) and pregnant women
		Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, older people, disabled people (those with a LLTI) and pregnant women
		Construction sites and diversions can create severance in terms of travel. Diversions are likely to be short in urban areas, but possibly longer for those living in rural areas. Some diversions may also be in place for longer periods for particular works. Severance and diversions can impede access to healthcare and other community facilities, interrupt social networks, and therefore can impact on health and wellbeing.	Temporary	Construction	Adverse	Physical infrastructure	Low	High	Children, disabled people, older people, people with pushchairs / prams, women
Ebbw Valley Line Scheme 84: HR Station at Newport West	Construction of new station.	Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, older people, disabled people (those with a LLTI) and pregnant women
		Building a new station has the potential to restricting access to green space through the new building footprint. There is clear evidence that access to green spaces is associated with positive health outcomes.	Permanent	Operation	Adverse	Lifestyle	Low	Medium	Children, older people, pregnant women,
		Construction sites and diversions can create severance in terms of travel. Diversions are likely to be short in urban areas, but possibly longer for those living in rural areas. Some diversions may also be in place for longer periods for particular works. Severance and diversions can impede access to healthcare and other community facilities, interrupt social networks, and therefore can impact on health and wellbeing.	Temporary	Construction	Adverse	Physical infrastructure	Low	High	Children, disabled people, older people, people with pushchairs / prams, women
Mainline Relief Lines Scheme 71: HR Electrification of existing HR lines between Cardiff Central & Severn Tunnel Junction (plus Scheme 81 additional services through Severn Tunnel Junction) Schemes 152 and 204: Upgrade of station plus P&Ride Cardiff Central, Schemes 76, 77: HR electric stations Rumney and St Mellons Scheme 168: Park and Ride Llanwern	Installation of gantries, expansion of existing parking facilities, additional train services.	Replacement of polluting vehicles with newer less-polluting park and ride vehicles will help to improve air quality. General improvements in air quality will help reduce the incidence of respiratory and cardiovascular disease. Benefits depend on the scale of the total contribution of the change.	Permanent	Operation	Benefit	Environment	Low	Low	Children, older people, disabled people (those with a LLTI) and pregnant women
		Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, older people, disabled people (those with a LLTI) and pregnant women

<b>Newport BRT Network Schemes 80, 102 and 104: Newport – Cardiff, Newport – Celtic Springs, Newport – Celtic Manor, Celtic Manor – Monmouth and Newport – Malpas (also includes Cross Valleys BRT)</b>	Road works to provide priority running (possible segregation) for buses to reduce delays due to congestion.	Reducing the number of cars on the roads will help to improve air quality. General improvements in air quality will help reduce the incidence of respiratory and cardiovascular disease.	Permanent	Operation	Benefit	Environment	Low	Low	Children, older people, disabled people (those with a LLTI) and pregnant women
		Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, older people, disabled people (those with a LLTI) and pregnant women
		Construction sites and diversions can create severance in terms of travel. Diversions are likely to be short in urban areas, but possibly longer for those living in rural areas. Some diversions may also be in place for longer periods for particular works. Severance and diversions can impede access to healthcare and other community facilities, interrupt social networks, and therefore can impact on health and wellbeing.	Temporary	Construction	Adverse	Physical infrastructure	Low	High	Children, disabled people, older people, people with pushchairs / prams, women
<b>Dualling of existing lines Cardiff Bay to Cardiff Queen Street, Heath to Coryton, Radyr – Taffs Well, Abercynon – Aberdare, Porth – Treherbert, Troed-y-Rhiw-Pentrebach, Bargoed - Rhymney</b>	Installation of additional line adjacent to existing along key corridors to allow enhanced frequency running.	Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Negligible	High	Children, disabled people, older people, people with pushchairs / prams, women
		Clearance of an area of woodland has the potential to limit access to green space. There is clear evidence that access to green spaces is associated with positive health outcomes.	Permanent	Operation	Adverse	Lifestyle	Low	Medium	Children, older people, pregnant women
<b>Rhymney package Less Likely Options (P&amp;R Rhymney, Ystrad Mynach, Bargoed, Pengam, Llanbradach and Cardiff Gate. LR to Cardiff Gate, BRT to Cardiff Gate, New LR stations Wedal Rd, Crwys Rd. Station upgrade Ystrad Mynach, and Re-opening of HR alignment as LR plus on-street Hengoed to Blackwood</b>	Combination of 6 No. Park and Ride facilities, new light rail (electric) to Cardiff Gate, Bus improvement measures to Cardiff gate, New Stations in Cardiff and re-opening of historic rail line (plus on street running) Hengoed to Blackwood.	Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, disabled people, older people, people with pushchairs / prams, women
<b>MTA lines package Less Likely Options (BRT Maerdy – Porth and Cardiff-Pontypridd, LR on street Merthyr-Dowlais Top)</b>	Bus line improvement options and on-street or tram type running.	Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, disabled people, older people, people with pushchairs / prams, women

NW Corridor, less likely options (P&Ride Pontyclun, Miskin, J33. BRT Cardiff – Pontyclun, Pontyclun-Church Village – Pontypridd, Cardiff – Talbot Green. HR station St. Fagans. Bus and Rail interchange Ely Paper Mill	3 No. Park and Ride sites, bus rapid transit measures, new heavy rail (diesel) station on existing line and a new bus / rail interchange.	Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Low to moderate	High	Children, disabled people, older people, people with pushchairs / prams, women
		Construction sites and diversions can create severance in terms of travel. Diversions are likely to be short in urban areas, but possibly longer for those living in rural areas. Some diversions may also be in place for longer periods for particular works.	Temporary	Construction	Adverse	Physical infrastructure	Low	High	Children, disabled people, older people, people with pushchairs / prams, women
VOG Package – Less likely options (BRT priority measures, Cardiff – Dinas Powys)	Road works to provide BRT. New rail line (short length across farmland, new HR station and new Park and Ride	Replacement of polluting vehicles with newer less-polluting park and ride vehicles will help to improve air quality. General improvements in air quality will help reduce the incidence of respiratory and cardiovascular disease.	Permanent	Operation	Benefit	Environment	Low	Low	Children, older people, disabled people (those with a LLTI) and pregnant women
		Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, disabled people, older people, people with pushchairs / prams, women
		Construction activities generating noise, which can cause annoyance to those living nearby. It is assumed that no night time working will be undertaken.	Permanent	Operation	Adverse	Environment	Low	Low	Children, older people and pregnant women
Bridgend Package – Less Likely Options (BRT Bridgend – Blaengarw, Bridgend – Maesteg, Bridgend – Treorchy, Bridgend-Cowbridge-Cardiff. Track doubling Garth-Tondu. P & Ride Pyle, Bridgend, HR Station, Brackla and Enhanced frequency HR diesel Cardiff Central – Pontyclun	Roadworks to deliver bus enhancement measures, additional track adjacent to existing between Garth and Tondu, single park and ride near Bridgend, new rail station in Brackla and more regular train service (modern diesel) between Cardiff and Pontyclun.	Replacement of polluting vehicles with newer less-polluting vehicles will help to improve air quality. General improvements in air quality will help reduce the incidence of respiratory and cardiovascular disease.	Permanent	Operation	Benefit	Environment	Low	Low	Children, older people, disabled people (those with a LLTI) and pregnant women
		Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, older people, disabled people (those with a LLTI) and pregnant women
		Construction activities generating noise, which can cause annoyance to those living nearby. It is assumed that no night time working will be undertaken.	Permanent	Operation	Adverse	Environment	Low	Low	Children, older people and pregnant women
Ebbw Valley Line Less likely Options (HR electric upgrade Cardiff Central – Ebbw Vale, HR diesel spur to Abertillery, BRT Abertillery – Newbridge, P & Ride Wern industrial estate, HR station Crumlin	No description provided	Replacement of polluting vehicles with newer less-polluting vehicles will help to improve air quality. General improvements in air quality will help reduce the incidence of respiratory and cardiovascular disease.	Permanent	Operation	Benefit	Environment	Low	Low	Children, older people, disabled people (those with a LLTI) and pregnant women
		Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, disabled people, older people, people with pushchairs / prams, women
Marches Package less likely options: Scheme 86: Enhanced frequency diesel Cardiff to Abergavenny HR stations Caerleon, Seastopol and Mamhilad. Park and Ride Abergavenny	No description provided	Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, disabled people, older people, people with pushchairs / prams, women
Cardiff on Street – Less Likely Options (P & R Coryton, LR Coryton - Radyr / Morganstown, LR Heath Holt - Wedal Rd, LR on street Cardiff – St. Mellons, LR to Culverhouse Cross, various on street LR options)	No description provided	Improved routes or new routes will generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social network is linked to improved health and wellbeing.	Permanent	Operation	Benefit	Physical infrastructure	Moderate	High	Children, disabled people, older people, people with pushchairs / prams, women

Source: Mott MacDonald, 2017

## 4 Conclusions

This report has presented the findings of the assessment of potential health impacts that are likely to arise as a result of the South Wales Metro Phases 2 and 3 scheme options. It forms a rapid HIA. There are key trends in the impacts across the scheme packages. These are outlined in Table 2.

**Table 2: Summary of health impacts**

Development stage	Health pathway	Health impact
Construction	Construction activities generating noise	Construction activities generating noise, which can cause annoyance to those living nearby.
Construction	Construction site and diversions creating severance to travel	Construction sites and diversions can create severance in terms of travel. Diversions are likely to be short in urban areas, but possibly longer for those living in rural areas. Some diversions may also be in place for longer periods for particular works. Severance and diversions can impede access to healthcare and other community facilities, interrupt social networks, and therefore can impact on health and wellbeing.
Operation	Replacement of polluting vehicles with newer less-polluting vehicles will help to improve air quality	Improvements to ambient air quality will help reduce the incidence of respiratory and cardiovascular disease. Use of both light and heavy rail technology is likely to help to improve air quality, as new rolling stock introduced on the routes is likely to result in lower emissions. The greatest potential improvement in air quality would be achieved by adoption of electrically powered trains rather than diesel.
Operation	Replacement of noisy vehicles with newer, quieter vehicles will reduce noise pollution	Use of new rolling stock or new track can help reduce noise pollution which will have positive health benefits to local residents.
Operation	Improved routes or new routes generating additional connectivity and accessibility	Improved routes or new routes could generate additional connectivity and accessibility. Improved access to employment, social infrastructure, education and social services has been shown to be linked to improved health and wellbeing outcomes.
Operation	Increased frequency of services	Increased frequency of services will make using public transport more attractive and encourage greater use with a consequential reduction in car usage. This will have positive health benefits through increased active travel, improved connectivity to employment and social networks, improved access to healthcare and other social services.

### 4.1 Recommended mitigation measures

The following measures should be considered to mitigate potential negative impacts and optimise positive impacts of the scheme options:

- Implement appropriate construction noise mitigation targeting the most affected receptors, and use a contractor with a proven track record of delivering projects in accordance with BS 5228:2009.
- Work with the local healthcare providers to develop a travel management plan to consider and minimise impacts on emergency services, in particular ambulance journeys to, and between, hospitals.
- Careful consideration of any highway or pedestrian route diversions to minimise distances and durations, for both motorised and non-motorised vehicle users. Best practice methods to minimise driver stress during construction including delay time signage.

- Seek to secure construction phase employment for local people through contractual measures. These could include incentivising contractors to recruit locally, to deliver apprenticeships and skills or vocational training for local people.
- Use the opportunity presented by the development to promote public transport. This could involve the following: promotion; pricing; and adapted bus and rail routes.
- Consider the needs of disabled people, particularly the visually and mobility impaired with regard to accessibility at stations.
- Use the opportunity presented by the development to promote active travel. This could involve the following: promotion; including wayfinding and signposting for pedestrians and cyclists at points around the new infrastructure; increasing cycle training schemes; and consider additional cycling and walking infrastructure (e.g. parking and routes).

# Appendices

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# A. Methodology

## A.1 Screening

The Welsh Health Impact Assessment Support Unit guidance sets out a number of screening questions that help identify whether or not to proceed with the subsequent stages of the HIA process:

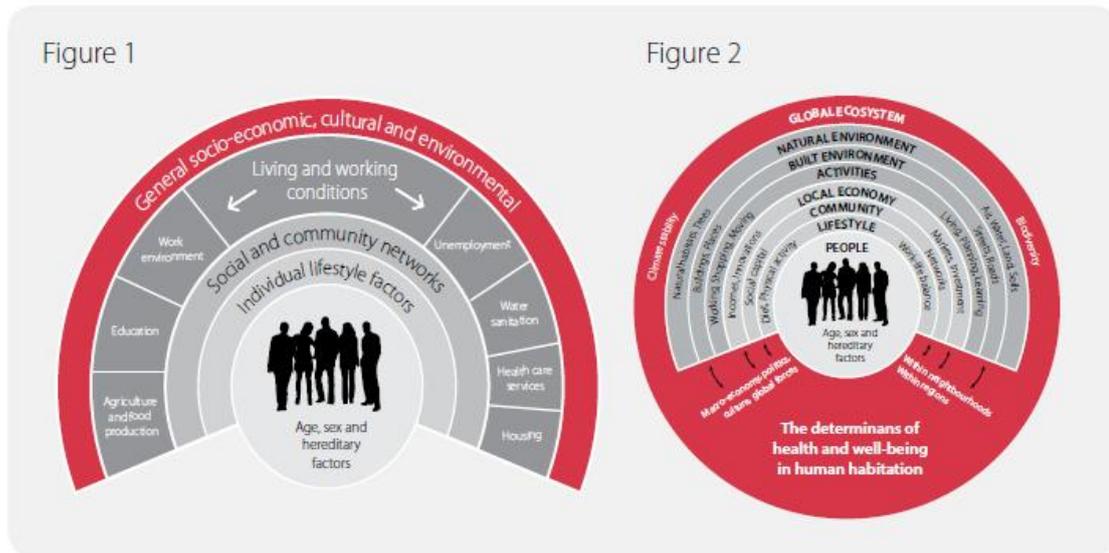
- Is the proposal likely to impact on health?
- Which sections of the population, particularly vulnerable groups, are likely to be affected?
- What is the possible scale of the impacts and whether these are likely to be positive or negative?
- Is a desktop, rapid or comprehensive HIA needed?

In answering these questions the screening process considered the socio-economic or social groups set out below:

- Age;
- Disability;
- Pregnancy and maternity;
- Race (including ethnic or national origins, colour or nationality);
- Religion or belief (including lack of belief);
- Gender;
- People living in areas exhibiting poor economic indicators; and
- People living in areas exhibiting poor health indicators.

As the South Wales Metro Phases 2 and 3 developments are expected to change usage of the rail and bus network, there is potential for it to have a significant impact upon human health. The planning of the development is still in process meaning the specifics of activities involved are subject to change. A list of the potential works exists which comprises of 33 schemes. This is not a finalised list and the detailed construction activities are likely to change. Consequently, it was deemed that a high level or “rapid” HIA was required. This has been prepared alongside the Strategic Environmental Assessment. A more comprehensive assessment will be prepared once the scheme options have been finalised.

The key determinants of health and the potential impacts that are likely to arise as a result of the South Wales Metro Phases 2 and 3 were identified at the screening stage, drawing on the screening templates that are available in both the Welsh Health Impact Assessment Support Unit guidance and in WelTAG. The screening templates are heavily based on the social and health determinants framework developed by Dahlgren and Whitehead and later by Barton and Grant (1998) (see Figure 2).

**Figure 2: Determinants of health and well-being**

Source: Welsh Health Impact Assessment Unit (2014) *A Practical Guide*

The potential impacts that have been screened and that were further refined in the scoping stage are presented in Appendix B.

## A.2 Scoping

The scoping stage involved further refinement of the impacts that were screened in. The geographical extent of the assessment was also refined. This covers the 10 Welsh local authorities that the Metro is physically located in as well as South Gloucestershire which also has part of the physical infrastructure located within its constituency.

## A.3 Rapid HIA assessment

A rapid HIA has been carried out assessing the baseline socio-economic and health situation in the study area and assessing the health determinants and impacts that are likely to occur as a result of the developments.

### A.3.1 Local context

A review of the joint strategic needs assessments for each of the 11 local authorities has been carried out to inform the potential impacts of the project on the health of local communities and service users.

### A.3.2 Socio economic and health baseline indicators

A baseline of key health related indicators within the impact area has been prepared. Indicators include:

- employment levels;
- income;
- health related indicators; and
- quality of life indicators.

A summary of the key findings is presented in the main report, and the full baseline is in Appendix C.

### **A.3.3 Identifying and assessing the impacts**

Drawing on the information gathered through the qualitative and quantitative research, the impacts of the project on health have been identified. Each of the impacts have been graded based upon whether it is beneficial or adverse, its severity and the extent of the population affected. The stage of the development in terms of construction or operations has also been considered.

There are currently 33 potential schemes that are being considered for the South Wales Metro. These have been grouped together for the SEA in order to analysis schemes that are likely to have similar impacts and have been carried through in the HIA to ensure consistency. A matrix of the group schemes and their potential health impacts has been prepared and is presented in Chapter 3.

### **A.4 Stakeholder engagement**

This rapid HIA report is subject to public consultation.

### **A.5 Monitoring and evaluation**

Measures to monitor and evaluate potential health impacts will be identified at a future stage.

## B. Summary of impacts covered in the screening and scoping stages

Phase	Determinant of health	Health impact	Features of the scheme	Potential health effect	Further assessment in Rapid HIA?
Construction	Environment	Air	Construction activity could generate dust on site; and construction traffic could generate additional emissions	Changes in respiratory and cardiovascular conditions, particularly near schools or hospitals	Yes
		Noise	Construction activity could generate noise and vibration at construction sites	Changes in levels of annoyance, concentration and stress, particularly near schools or hospitals	Yes
	Physical infrastructure	Safety	Increase in construction traffic creating risk to personal safety, construction activities at stations and other public areas also creates a risk. Also risk for construction workers.	Increase in number of incidents, such as accidents, deaths amongst workers and public.	No, controlled by existing legislative framework in the UK and measures in the construction environment management plan will set out the processes to implement this legislation
		Severance	Construction work may limit access to the existing infrastructure temporarily	The change in access could lead to members of the public's access to other services being restricted, such as education, hospitals and other health facilities, and community centres, and formal or informal space causing health problems going unaddressed.	Yes
		Housing demolition	Construction work may require land and property acquisition	Mental health related impacts of resettlement including increase in stress.	Yes
	Socio-economic conditions	Generation of temporary employment	Construction work will generate temporary work for the local population leading to temporary improved socio-economic conditions.	Due to its temporary nature the impact on health may be limited.	Yes

Phase	Determinant of health	Health impact	Features of the scheme	Potential health effect	Further assessment in Rapid HIA?	
Operational	Environment	Air	Improved bus including park and ride, and improvements to rail taking traffic off the roads, electrification leading to reduced air emissions	Reduction in respiratory illness, particularly important near vulnerable people, schools and hospitals, and care homes	Yes	
		Noise	Change in traffic leading to a change in road noise, and electrification leading to a change in rail noise.	Reduction in noise related stress, particularly important for schools and hospitals	Yes	
	Physical infrastructure	Traveller stress				Yes
		Safety	Improvements to stations may increase safety	Improved safety likely to lead to reduce accident rate.	No, controlled by existing legislative framework in the UK and measures in the construction environment management plan will set out the processes to implement this legislation	
		Accessibility to the infrastructure	Improved bus facilities, and new stations improving access for people to access the rail network	Improved access leading to greater mobility of the population, improving health, mental and physical welfare.	Yes	
		Journey times	Improved network leading to greater access to health care facilities	Reduction in time seen by medical staff, improved mortality rates; reduced stress	Yes	
	Socio-economic conditions	Access to employment opportunities	Improved network will increase the opportunities for communities that previously couldn't access the network easily to use the network to get to employment opportunities	Being employed has been found to lead to improved health	Yes	
	Lifestyle	Physical activity	Consideration of whether healthy transport options will be factored into the scheme	Improved cycling facilities leading to an increase in physical activity and a resulting improved health of the population	Yes although cycling provision is a level of detail that is not applicable to the current stage of scheme design.	
		Access to green space	Improve network creating new opportunities to access green space	Access to green space has a positive effect on welfare	Yes	

## C. Baseline conditions

### C.1 Introduction

This section sets out the socioeconomic profile of the study area and presents data on the current demographic, social, health and economic context of the study area<sup>3</sup>, and in England and Wales.

#### C.1.1 Summary health indicators

The majority of the health indicators show that the study area figures are slightly more adverse than the national averages and the averages for England and Wales combined.

**Table 3: Health indicators summary**

Health Indicator	Summary analysis			
<b>Life expectancy</b> <sup>4</sup>	Life expectancy in the study area is marginally below the national averages and those for for England and Wales. Although there are slight variations in life expectancy across the eleven local authorities, these are relatively minor.			
	<b>Study area</b>	<b>Males</b>		<b>Females</b>
	Total Study Area	78.0		82.1
	Wales	78.20		82.22
	England and Wales	79.11		82.93
<b>Smoking levels (current smokers)</b> <sup>5</sup>	The proportion of current smokers in the total study area is slightly above the national figures for Wales, and for England and Wales combined. Two local authorities, Blaenau Gwent and Caerphilly, have proportions higher than the study area and national averages. Levels of ex-smokers are fairly consistent across the study area.			
	<b>Study area</b>	<b>Current smoker</b>		
	Total Study Area	17.4%		
	Wales	16.9%		
	England and Wales	16.2%		
<b>Limiting Long Term Illness (LLTI)</b> <sup>6</sup>	For the purposes of this demographic profile, we have analysed the number of people living with a LLTI within census and mid-year population data as a proxy measure for disability. The proportion of people living in the study area with a LLTI is marginally lower than the national average but higher than the average for England and Wales. Three local authorities, Blaenau Gwent, Merthyr Tydfil and Rhondda Cynon Taff, have particularly high proportions of people with a LLTI.			
	<b>Study area</b>	<b>Total population 2011</b>	<b>LLTI</b>	<b>LLTI%</b>
	Total study area	1,744,337	374,647	21%
	Wales	3,063,456	695,855	23%
	England and Wales	56,075,912	10,048,441	18%

<sup>3</sup> The study area is defined as the following eleven local authorities: Blaenau Gwent, the Vale of Glamorgan, Caerphilly, Newport, Merthyr Tydfil, Bridgend, Rhondda Cynon Taff, South Gloucestershire, Torfaen, Cardiff, and Monmouthshire,

<sup>4</sup> ONS (2014)

<sup>5</sup> ONS (2016)

<sup>6</sup> ONS Census– mid-year population estimates 2015

Health Indicator	Summary analysis
<b>Physical activity</b>	Data on physical activity levels and obesity is not available at local authority level, but data at a national level has been assessed. The National Survey for Wales <sup>7</sup> indicates that 32% of the population of Wales do less than 30 minutes of moderate to vigorous physical activity (MVPA) per week, 14% do between 30 and 149 minutes and 54% do the recommended 150 minutes per week. These figures are worse than those for England, where 26% of people do less than 30 minutes, and 60% do more than 150 minutes. <sup>8</sup>
<b>Obesity</b>	The low levels of physical activity are likely to be a significant contributing factor to high levels of obesity within Wales. Data on levels of obesity are not available at local authority level, but data from the National Survey for Wales indicates that 59% of the population of Wales have a Body Mass Index (BMI) that indicates that they are overweight or obese. Certain groups are more likely to be overweight or obese, for example 65% of men, compared to 53% of women have a BMI that puts them in this category. This compares to 58% of women and 65% of men in England, indicating that equivalent numbers of men in England and Wales are overweight or obese, but slightly less women in Wales have a high BMI compared to England. <sup>9</sup>

Source: Mott MacDonald 2017

## C.2 Demographic profile

### C.2.1 Age

This section explores three key age brackets that are more vulnerable to health impacts than the general population:

- Children (aged under 16);
- Young people (aged 16 to 25); and
- Older people (aged 65 and over).

#### **Children (under 16s)**

Table 4 indicates that the proportion of people living in the study area who are under 16 is in line with the national average (18%) as well as the average for England and Wales combined (18%). None of the local authority areas have proportions that are significantly lower or higher than the national average.

The map below (Figure 3) illustrates that:

- The cities of Cardiff and Newport have high densities of people aged under 16. There are also areas in South Gloucestershire, as well as the towns of Barry and Bridgend that have high densities.
- As the region as a whole is very rural, the majority of people under 16 live in urban centres.

**Table 4: Number and proportion of people under the age of 16**

Study area	Total population	U16	U16%
Blaenau Gwent	69,544	12,140	17%
Bridgend	142,092	25,597	18%
Caerphilly	180,164	34,225	19%
Cardiff	357,160	65,852	18%
Merthyr Tydfil	59,324	11,102	19%

<sup>7</sup> This is a large-scale survey of adults in Wales, covering a range of topics such as wellbeing and people's views on public services. Data presented here is from the period April 2016 to March 2017. National Survey for Wales (2017): 'Results viewer'.

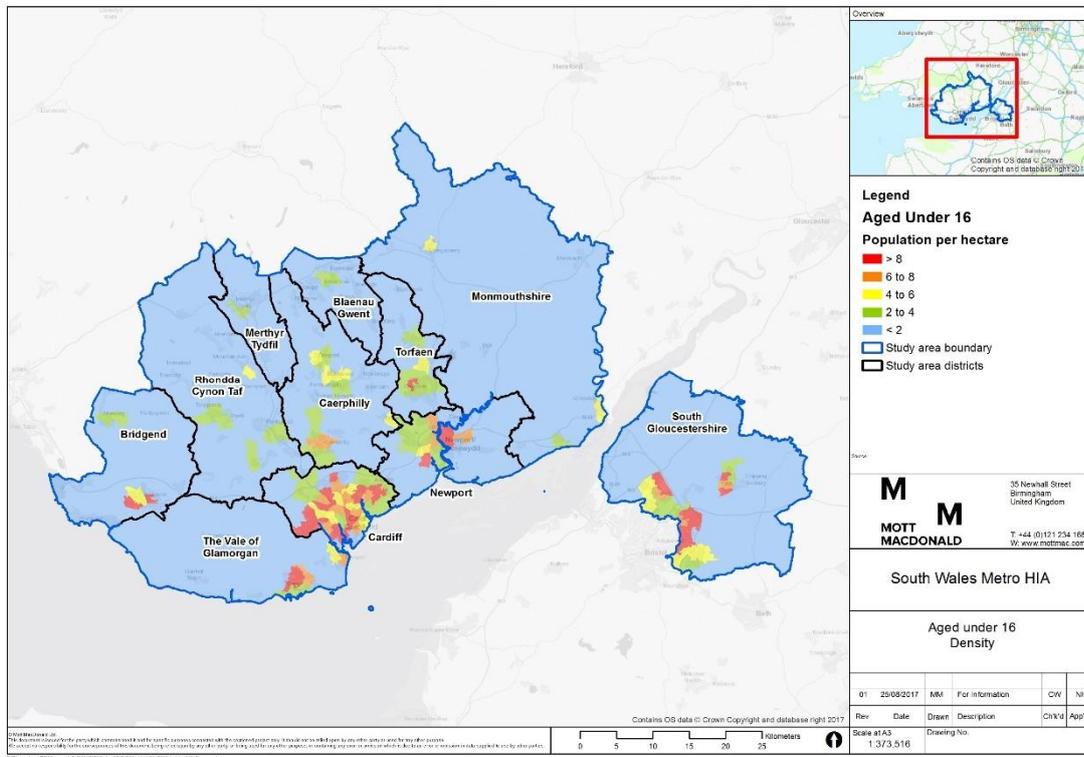
<sup>8</sup> Sport England (2016): 'Active lives survey'.

<sup>9</sup> Health and social care information (2016): 'Statistics on obesity, physical activity and diet'.

Study area	Total population	U16	U16%
Monmouthshire	92,476	15,490	17%
Newport	147,769	29,677	20%
Rhondda Cynon Taff	237,411	44,122	19%
South Gloucestershire	274,661	51,018	19%
Vale of Glamorgan	127,592	23,623	19%
Torfaen	91,836	16,836	18%
<b>Total Study Area</b>	<b>1,780,029</b>	<b>329,682</b>	<b>19%</b>
Wales	3,099,086	555,289	18%
England and Wales	57,885,413	10,960,403	19%

Source: ONS Census 2011 – mid-year population estimates 2015

Figure 3: Under 16 population density per hectare



Source: ONS Census 2011 – mid-year population estimates 2015

**Young people aged 16 - 25**

Table 5 indicates that the proportion of people living in the study area aged 16 to 25 is in line with the national average (13%) and the average for England and Wales combined (13%). None of the local authority areas have proportions that are notably lower or higher than the national figures.

**Table 5: Number and proportion of people aged 16 to 25**

Study area	Total population	16-25	16-25%
Blaenau Gwent	69,544	8,751	13%
Bridgend	142,092	16,113	11%

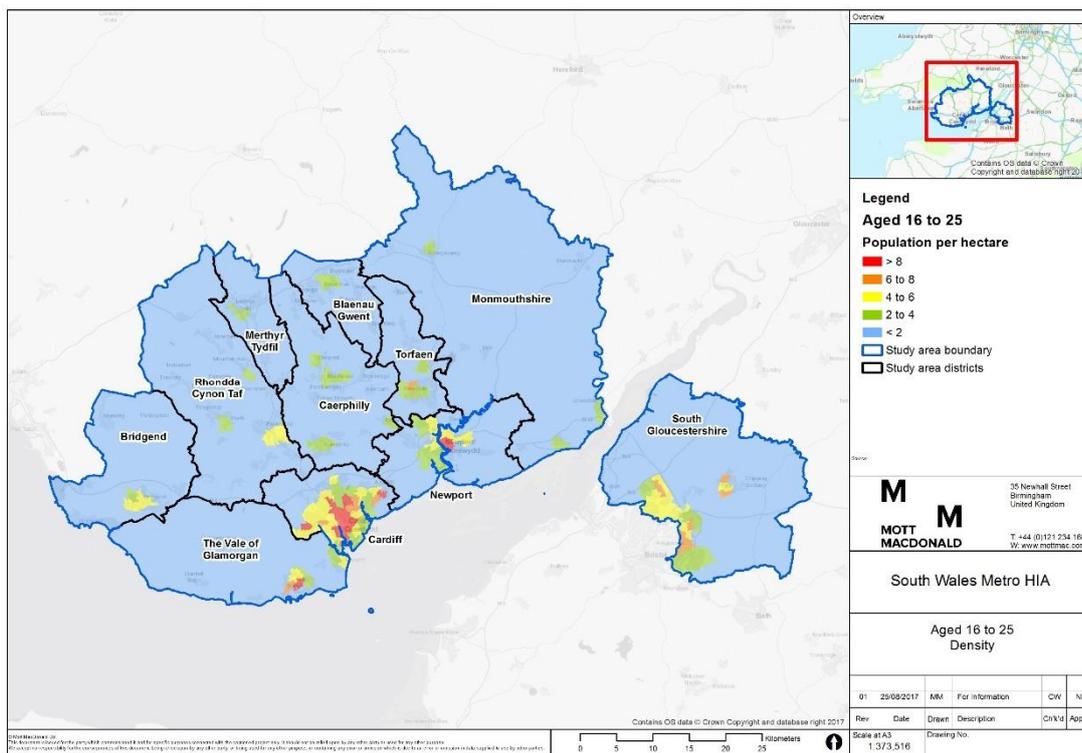
Caerphilly	180,164	21,634	12%
Cardiff	357,160	68,719	19%
Merthyr Tydfil	59,324	7,405	12%
Monmouthshire	92,476	9,649	10%
Newport	147,769	19,149	13%
Rhondda, Cynon, Taff	237,411	31,430	13%
South Gloucestershire	274,661	33,800	12%
Vale of Glamorgan	127,592	14,268	11%
Torfaen	91,836	11,409	12%
<b>Total Study Area</b>	<b>1,780,029</b>	<b>242,327</b>	<b>14%</b>
<b>Wales</b>	<b>3,099,086</b>	<b>406,804</b>	<b>13%</b>
<b>England and Wales</b>	<b>57,885,413</b>	<b>7,354,269</b>	<b>13%</b>

Source: ONS Census 2011 – mid-year population estimates 2015

The map below (Figure 4) illustrates that:

- The area with highest density of people aged 16 to 25 is in Cardiff, which has high density located around the city centre.
- There are other areas with moderate densities, such as Barry, Bridgend, Newport, parts of western South Gloucestershire and Pontypridd.

**Figure 4: 16-25 population density per hectare**



Source: ONS Census 2011 – mid-year population estimates 2015

### Older people (65 and over)

Table 6 indicates that the proportion of people living in the study area who are over 65 (18%) is broadly in line with both the national average (20%) and the average for England and Wales (18%). Cardiff has a slightly lower proportion of those aged over 65 (14%). Only one local authority has a higher proportion of people aged 65 and over; 24% of the population of Monmouthshire are over 65.

**Table 6: Number and proportion of people over 65**

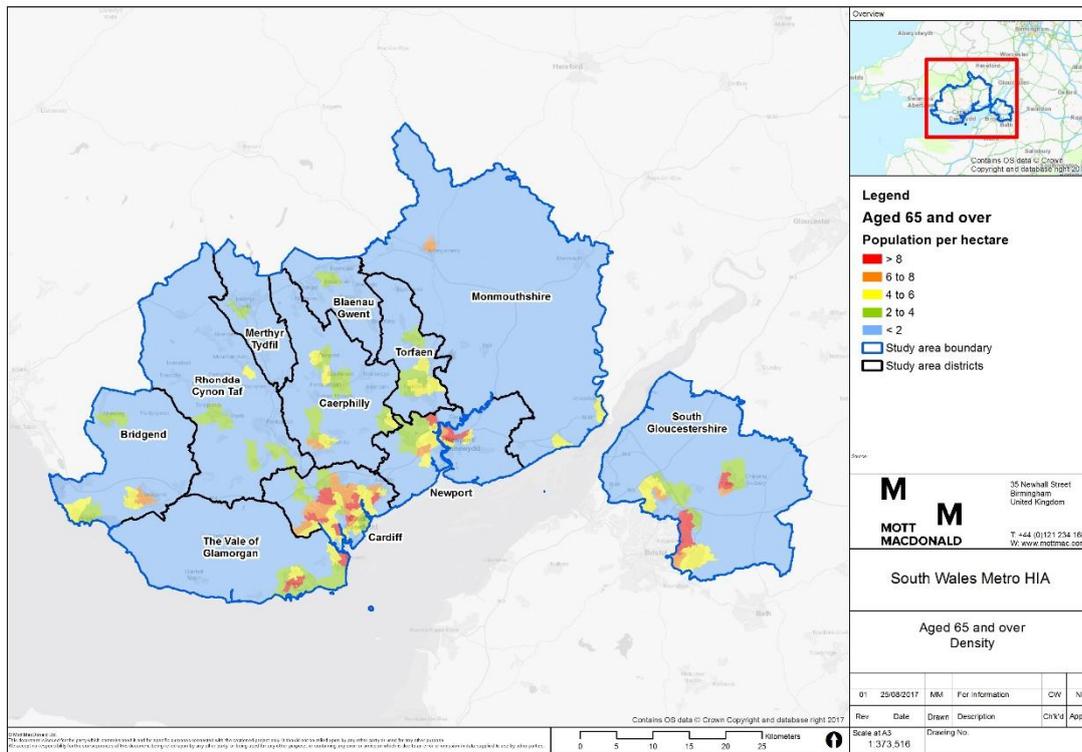
Study area	Total population	Over 65	Over 65%
Blaenau Gwent	69,544	13,552	19%
Bridgend	142,092	27,859	20%
Caerphilly	180,164	33,381	19%
Cardiff	357,160	49,588	14%
Merthyr Tydfil	59,324	10,745	18%
Monmouthshire	92,476	21,871	24%
Newport	147,769	25,808	17%
Rhondda, Cynon, Taff	237,411	44,380	19%
South Gloucestershire	274,661	50,481	18%
the Vale of Glamorgan	127,592	25,973	20%
Torfaen	91,836	18,107	20%
<b>Total Study Area</b>	<b>1,780,029</b>	<b>321,745</b>	<b>18%</b>
Wales	3,099,086	624,773	20%
England and Wales	57,885,413	10,336,345	18%

Source: ONS Census 2011 – mid-year population estimates 2015

The map below (Figure 5) illustrates that:

- The highest densities of people aged 65 and over are located in and around Cardiff, and Newport. This is due to a larger population living in these areas. As a percentage, these areas actually have the lowest proportion of people aged 65 or over.

**Figure 5: Over 65 population density per hectare**



Source: ONS Census 2011 – mid-year population estimates 2015

### C.2.2 Disability

The Equality and Human Rights Commission notes that: “You’re disabled under the Equality Act 2010 if you have a physical or mental impairment that has a 'substantial' and 'long-term' effect on your ability to do normal daily activities.”<sup>10</sup>

For the purposes of this demographic profile, the number of people living with a LLTI within census and mid-year population data has been analysed.

As identified in Table 7 below, the proportion of people living in the study area with a LLTI (21%) is lower than the national average (23%) but marginally higher than the average for England and Wales combined (18%). Six local authorities have higher proportions of people living with an LLTI (5% or more above England and Wales); Blaenau Gwent (27%), Merthyr Tydfil (27%), Rhondda Cynon Taff (26%), Caerphilly (25%), Bridgend (25%) and Torfaen (24%).

South Gloucestershire has a lower figure of 16% and Cardiff has a slightly lower proportion than the study area average (18%).

<sup>10</sup> See: <http://www.equalityhumanrights.com/advice-and-guidance/new-equality-act-guidance/protected-characteristics-definitions/>.

**Table 7: Number and proportion of people living with a LLTI**

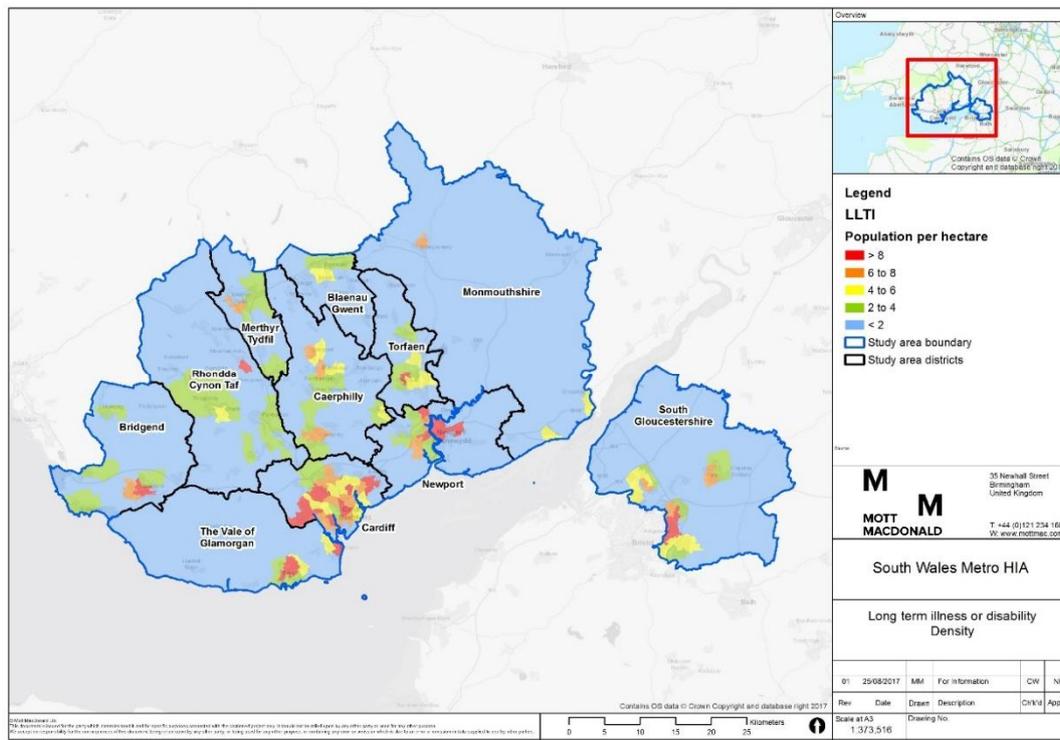
Study area	Total population 2011	LLTI	LLTI%
Blaenau Gwent	69,814	19,009	27%
Bridgend	139,178	34,359	25%
Caerphilly	178,806	45,365	25%
Cardiff	346,090	62,331	18%
Merthyr Tydfil	58,802	15,796	27%
Monmouthshire	91,323	18,392	20%
Newport	145,736	30,316	21%
Rhondda, Cynon, Taff	234,410	60,589	26%
South Gloucestershire	262,767	40,914	16%
the Vale of Glamorgan	126,336	25,629	20%
Torfaen	91,075	21,947	24%
<b>Total Study Area</b>	<b>1,744,337</b>	<b>374,647</b>	<b>21%</b>
Wales	3,063,456	695,855	23%
England and Wales	56,075,912	10,048,441	18%

Source: ONS Census– mid-year population estimates 2015

The map below (figure 6) illustrates that:

- Newport and Cardiff have high densities of disabled people spread out across both cities.
- Although the majority of the region has low densities, largely owing to its rural nature, there are a large number of areas with moderate densities.

**Figure 6: LLTI population density per hectare**



Source: ONS Census 2011 – mid-year population estimates 2015

## C.3 Socio-economic status

### C.3.1 Employment rate

The Organisation for Economic Co-operation and Development defines the employment rates as a “measure of the extent to which available labour resources (people available to work) are being used”.<sup>11</sup> It is calculated as the ratio of the employed to the working age population – defined here as people aged 16 to 64.

Table 8 shows that the employment rate for the study area (72%) is slightly higher than the national average (71%) and lower than the average for England and Wales (74%). There are five local authorities where the employment rate is lower than in England and Wales; Blaenau Gwent (67%), Rhondda Cynon Taff (69%), Merthyr Tydfil (69%), Bridgend (69%) and Cardiff (69%). Two local authorities, South Gloucestershire (80%) and Monmouthshire (76%), have employment rates higher in comparison to England and Wales.

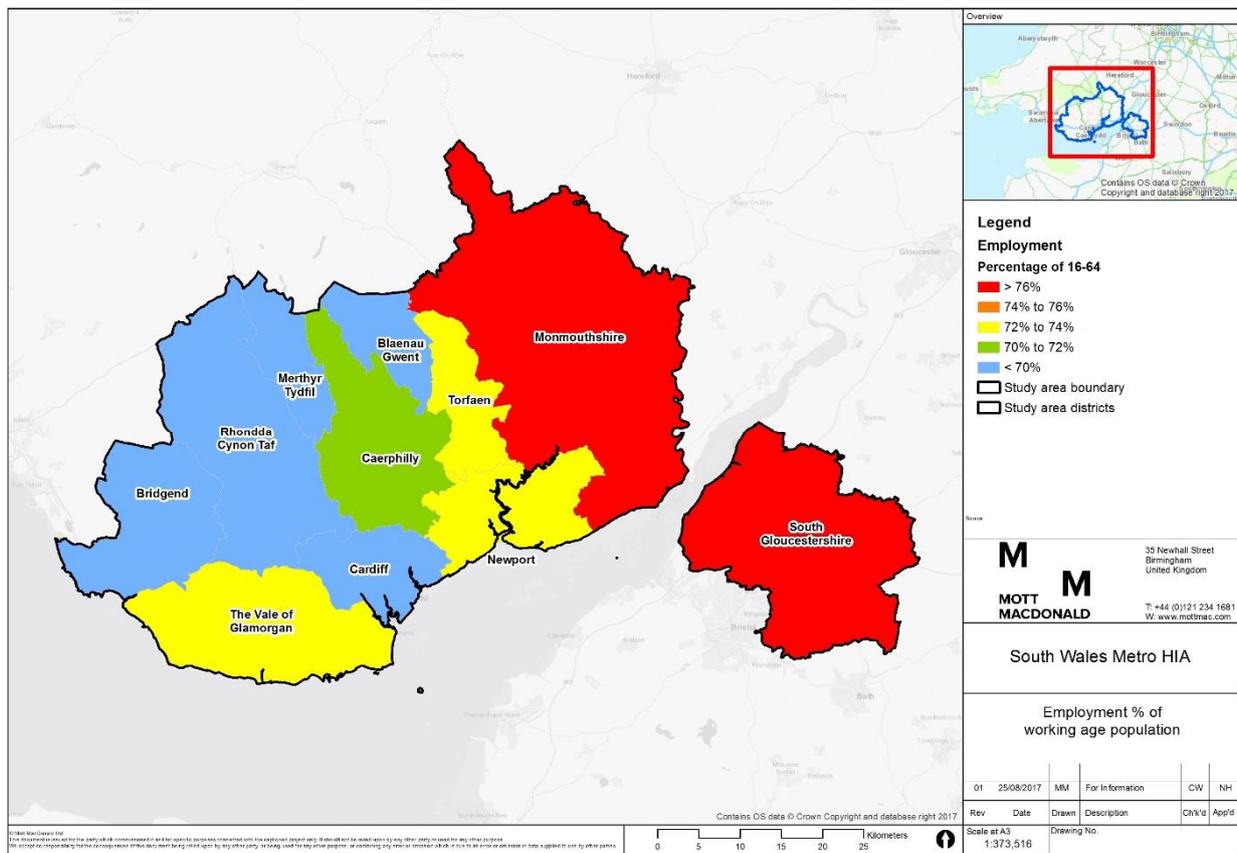
**Table 8: Employment rate (16-64)**

Study area	Number	Percentage
Blaenau Gwent	28,900	67%
Bridgend	60,100	70%
Caerphilly	79,600	71%
Cardiff	167,100	69%
Merthyr Tydfil	25,800	69%
Monmouthshire	41,200	76%
Newport	67,000	73%
Rhondda Cynon Taff	102,200	69%
South Gloucestershire	137,100	80%
Vale of Glamorgan	56,100	74%
Torfaen	41,700	74%
<b>Total Study Area</b>	<b>806,800</b>	<b>72%</b>
<b>Wales</b>	<b>1,358,700</b>	<b>71%</b>
<b>England and Wales</b>	<b>27,084,500</b>	<b>74%</b>

Source: ONS (2017) Annual Population Survey

<sup>11</sup> OECD (2017): 'Employment rate'.

**Figure 7: Employment rate 16-64**



Source: ONS (2017) Annual Population Survey

### C.3.2 Income levels

The Annual Survey of Hours and Earnings is the most detailed and comprehensive source of earnings information.<sup>12</sup> It is based upon a 1% sample of employee jobs, drawn from HMRC Pay-As-You-Earn (PAYE) records and provides the median annual gross income for full-time workers. Table 9 shows that the total study area has a median gross annual pay (£25,351) on a par with the national average (£25,400) but lower than for England and Wales combined (£28,336). There are six local authorities with a medium gross annual pay 10% or more below the England and Wales median; Blaenau Gwent (£21,454), Merthyr Tydfil (£23,196), Monmouthshire (£24,564), Vale of Glamorgan (£24,735) and Caerphilly (£25,340). Three of these have a median annual gross income that is £1,000 or more less than the study area. There are, however, local authorities with income that is £1,000 or more above the study area; Bridgend (£26,683), South Gloucestershire (£28,867) and Cardiff (£27,128).

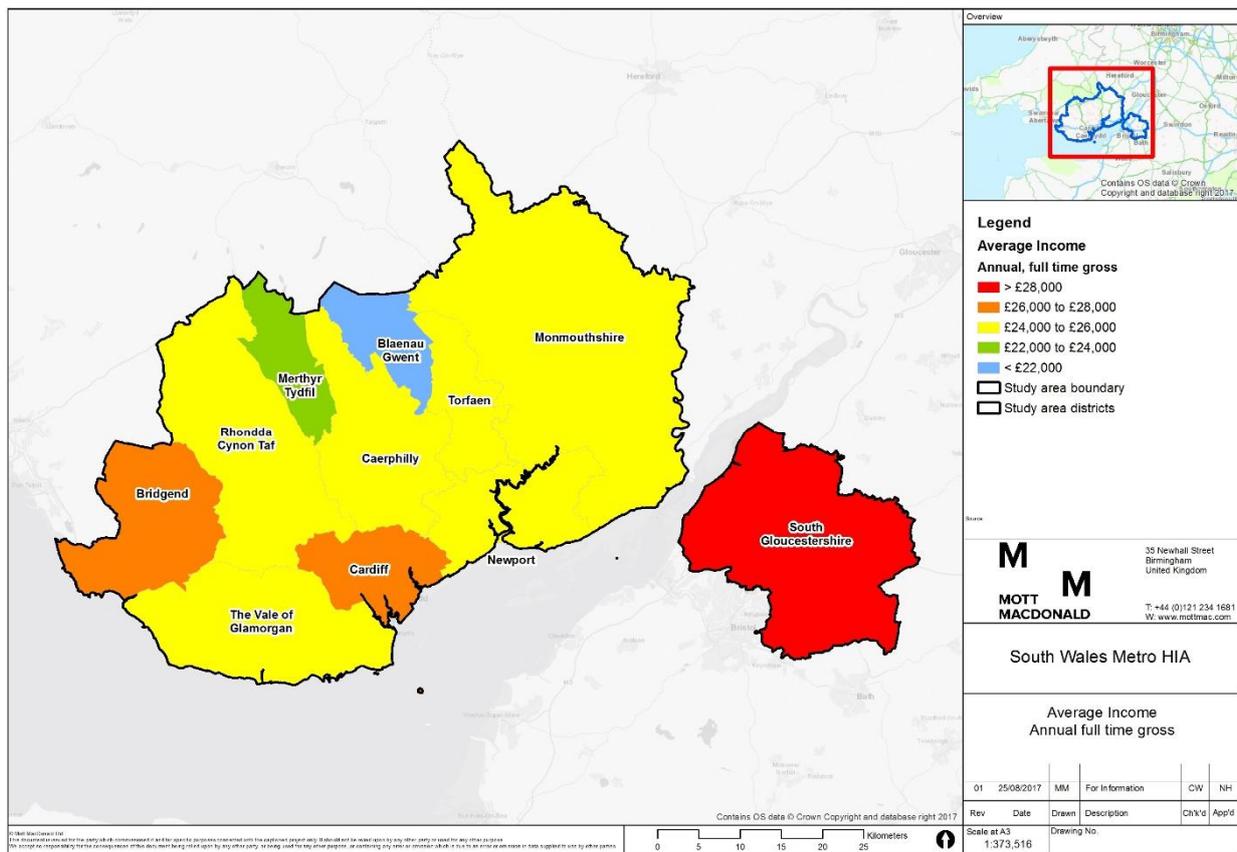
<sup>12</sup> ONS (2016): 'Annual survey of hours and earnings'.

**Table 9: Median annual pay - gross**

Study area	Median gross annual income
Blaenau Gwent	£21,454
Bridgend	£26,683
Caerphilly	£25,340
Cardiff	£27,128
Merthyr Tydfil	£23,196
Monmouthshire	£24,564
Newport	£25,358
Rhondda, Cynon, Taff	£25,696
South Gloucestershire	£28,867
Vale of Glamorgan	£24,735
Torfaen	£25,843
Average for Study Area	£25,351
Wales	£25,400
England and Wales	£28,336

Source: ONS (2016) Annual survey of hours and earnings

**Figure 8: Median annual pay - gross**



Source: ONS (2016) Annual survey of hours and earnings

### C.3.3 Children in low-income families

The children in low-income families measure is the proportion of children living in families either in receipt of out-of-work benefits or in receipts of tax credits with a reported income that is less than 60% of national median income.<sup>13</sup> This measure provides a broad proxy for relative low-income poverty as set out in the Child Poverty Act 2010 and enables analysis at a local level.

Table 10 shows that the study area has a higher percentage of both children under 16 (23%) and dependant under 20s (22%) living in low income families in comparison to England and Wales (21% and 20% respectively). Six local authorities; Blaenau Gwent, Caerphilly, Newport, Merthyr Tydfil, Rhondda Cynon Taff and Cardiff; have a higher proportion of both under 16s and under 20s living in low income families. South Gloucestershire and Monmouthshire though have lower proportions of children living in low income families.

**Table 10: Percentage of children in low income families**

Study area	Under 16	Under 20 <sup>14</sup>
Blaenau Gwent	30%	29%
Bridgend	24%	23%
Caerphilly	26%	25%
Cardiff	27%	26%
Merthyr Tydfil	28%	27%
Monmouthshire	13%	13%
Newport	26%	25%
Rhondda Cynon Taff	27%	27%
South Gloucestershire	12%	11%
Vale of Glamorgan	18%	18%
Torfaen	25%	24%
Total Study Area	23%	23%
Wales	23%	22%
England and Wales	21%	20%

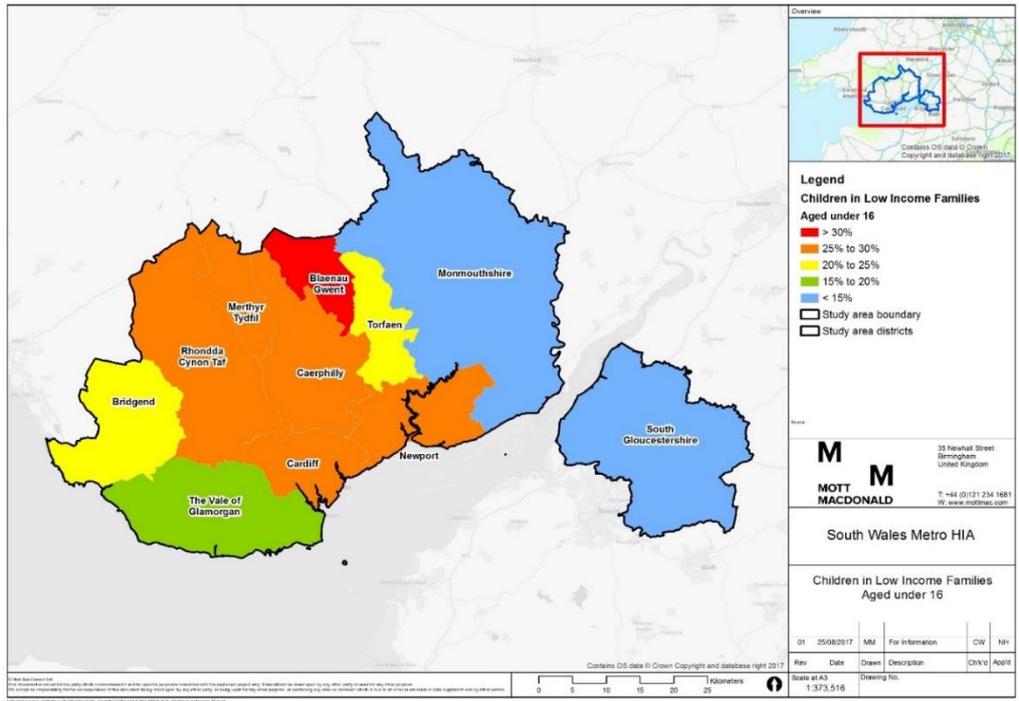
Source: HMRC (2016) (Personal Tax Credits: Related Statistics - Child Poverty Statistics)

Figures 9 and 10 show these statistics graphically.

<sup>13</sup> HMRC (2014): 'Personal tax credits: children in low-income families local measure'.

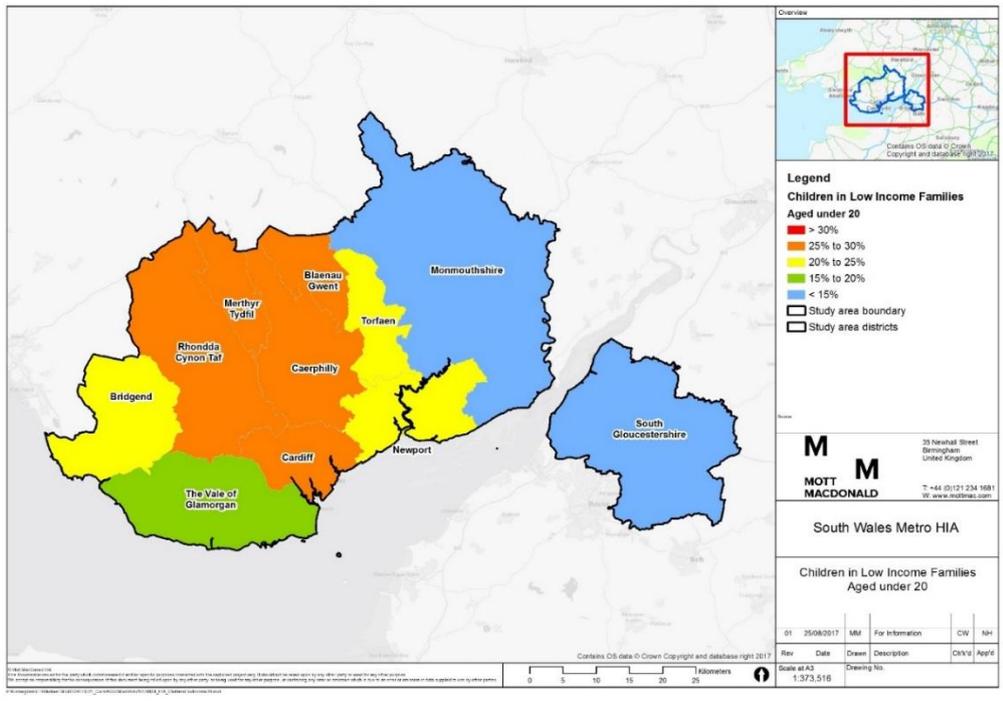
<sup>14</sup> This column includes dependent children under the age of 20. A dependent child is defined as an individual aged under 16 or 16-19 years old who is: not married or in a civil partnership nor living with a partner; living with parents; in full-time non-advanced education or in unwaged government training.

Figure 9: Percentage of children (under 16) in low income families



Source: HMRC (2016) (Personal Tax Credits: Related Statistics - Child Poverty Statistics)

Figure 10: Percentage of children (under 20) in low income families



Source: ONS (2016)

### C.3.4 Households with no access to a car

The ONS census has an indicator to show the number of households with no access to a car. This includes company cars and vans that are available for private use. It does not include motorbikes, scooters, or any cars / vans belonging to visitors.

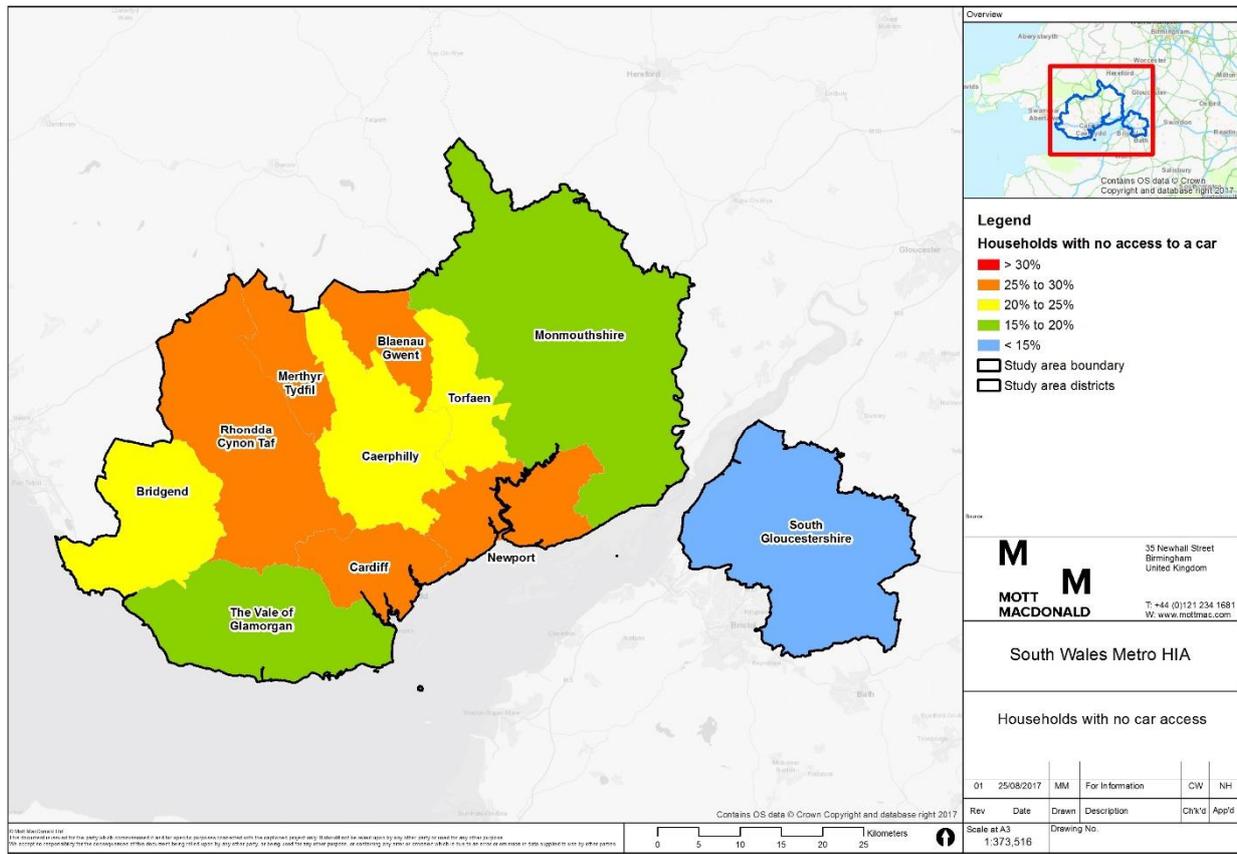
Table 11 shows that the percentage of households with no access to a car in the study area (24%) is in line with the national average (23%) and slightly lower than the average for England and Wales combined (26%). Five local authorities; Merthyr Tydfil (30%), Blaenau Gwent (29%), Cardiff (29%), Newport (28%) and Rhondda Cynon Taff (27%); have higher percentages of people without access to a car than the study area average. South Gloucestershire (13%), Monmouthshire (15%), and Vale of Glamorgan (19%) have lower proportions of people without access to a car. The data is presented graphically in Figure 11.

**Table 11: Households with no access to a car**

Study area	Households with no access to a car	Households with no access to a car (%)
Blaenau Gwent	8,811	29%
the Vale of Glamorgan	10,368	19%
Caerphilly	18,137	24%
Newport	17,076	28%
Merthyr Tydfil	7,213	30%
Bridgend	12,819	22%
Rhondda, Cynon, Taff	26,978	27%
South Gloucestershire	14,044	13%
Torfaen	9,090	24%
Cardiff	41,400	29%
Monmouthshire	5,807	15%
<b>Total Study Area</b>	<b>171,743</b>	<b>24%</b>
Wales	1,302,676	23%
England and Wales	23,366,044	26%

Source: ONS (2011) Census

Figure 11: Households with no access to a car



Source: ONS (2011) Census

### C.3.5 Indices of multiple deprivation (IMD)

The Index of Multiple Deprivation (IMD) is the official measure of relative deprivation for small areas of England and Wales (i.e. Lower-layer Super Output Areas). The IMD combines information from seven domains to produce an overall relative measure of deprivation.<sup>15</sup>

Table 12 shows that the proportion of those living in the most deprived quintile in the study area (22%) is broadly in line with the national average (20%). There are five local authorities within the study area; Blaenau Gwent (47%), Newport (32%), Rhondda Cynon Taff (34%), Merthyr Tydfil (29%) and Cardiff (27%); that have a higher proportion of people living in the most deprived quintile. The study area has a higher percentage of people (26%) living in the least deprived quintile, compared to England and Wales. Three regions have notably high percentages of people living in the least deprived quintile; Vale of Glamorgan (49%), Monmouthshire (37%) and Cardiff (30%).

<sup>15</sup> The domains are combined using the following weights: income deprivation (22.5%); employment deprivation (22.5%); education, skills and training deprivation (13.5%); health deprivation and disability (13.5%); crime (9.3%); barriers to housing and services (9.3%); and living environment deprivation (9.3%).

**Table 12: Index of Multiple Deprivation**

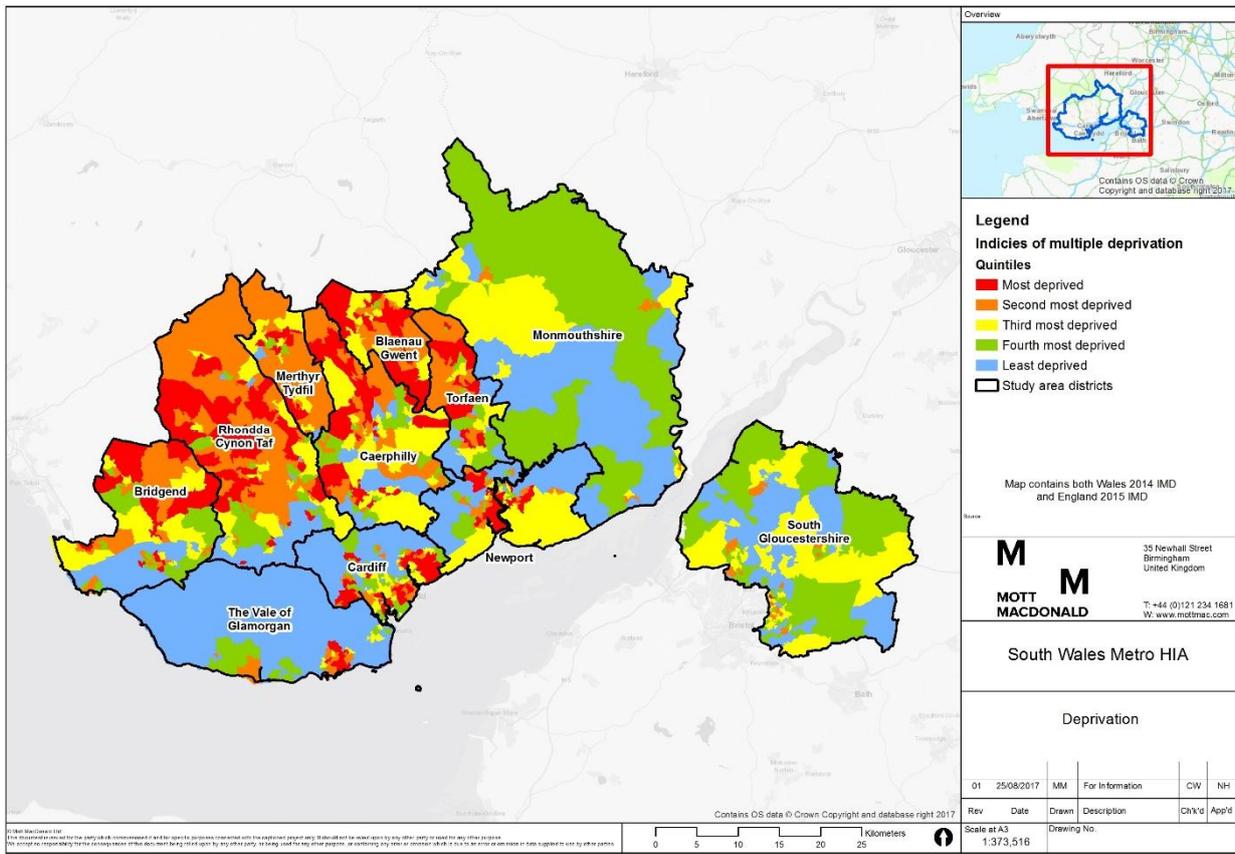
Study area	Most deprived	Second most deprived	Third most deprived	Fourth most deprived	Least deprived
Blaenau Gwent	47%	28%	24%	2%	0%
Bridgend	21%	26%	15%	16%	23%
Caerphilly	22%	20%	17%	16%	26%
Cardiff	27%	13%	13%	17%	30%
Merthyr Tydfil	29%	35%	22%	8%	6%
Monmouthshire	0%	13%	22%	29%	37%
Newport	32%	19%	14%	10%	25%
Rhondda Cynon Taff	34%	29%	14%	9%	13%
South Gloucestershire	21%	42%	26%	11%	1%
Vale of Glamorgan	14%	13%	11%	13%	49%
Torfaen	22%	25%	11%	18%	26%
Total Study Area	22%	20%	17%	16%	26%
Wales	20%	21%	20%	20%	19%
England and Wales	20%	20%	20%	20%	20%

Source: DCLG (2015) IMD

The map below (Figure 12) shows that:

- The most deprived areas are located in the north west of the study area, particularly in the local authorities of Bridgend, Rhondda Cynon Taff, Merthyr Tydfil, Blaenau Gwent and Torfaen.
- A large proportion of the population of the Vale of Glamorgan, Monmouthshire and Cardiff is in the least deprived quintile.

Figure 12: IMD



Source: DCLG (2015) IMD

## C.4 Health indicators

### C.4.1 Life expectancy

Life expectancy data is the average number of years a person would live if they experienced the particular area’s age-specific mortality rates for that time period throughout their lifetime. The below data presents male and female period life expectancy at birth.<sup>16</sup>

Table 13 shows that the study area as a whole has a life expectancy in line with national average for both men and women. Although there are slight variations in life expectancy across the eleven local authorities, these are relatively minor.

Table 13: Life expectancy (from birth, 2012)

Study area	Males (years)	Females (years)
Blaenau Gwent	75.7	79.9
Bridgend	77.0	80.6
Caerphilly	77.6	81.5
Cardiff	78.2	82.7

<sup>16</sup> ONS (2011): ‘Life expectancy at birth and at age 65 by local areas in England and Wales’.

Study area	Males (years)	Females (years)
Merthyr Tydfil	77.4	81.1
Monmouthshire	80.1	83.9
Newport	77.9	82.1
Rhondda, Cynon, Taff	76.4	81.0
South Gloucestershire	81.0	84.6
Vale of Glamorgan	79.6	83.4
Torfaen	77.6	82.1
Total Study Area	78.0	82.1
Wales	78.2	82.2
England and Wales	79.1	82.9

Source: ONS (2014)

### C.4.2 Smoking levels

Data on levels of smoking are provided in the Annual Population Survey. Table 14 shows that the figures for current smokers in the total study area (17%) is in line with the national average and the figure for England and Wales combined (16%). Two local authorities; Blaenau Gwent (21%) and Caerphilly (21%); have the highest proportions. South Gloucestershire (10%), has a much lower proportion of people who currently smoke. Levels of ex-smokers are consistent across the study area.

**Table 14: Smoking levels**

Study area	Current smoker	Ex-smoker	Never smoked
Blaenau Gwent	21%	24%	54%
Bridgend	19%	24%	58%
Caerphilly	21%	24%	55%
Cardiff	14%	25%	61%
Merthyr Tydfil	20%	23%	57%
Monmouthshire	13%	26%	61%
Newport	19%	22%	59%
Rhondda Cynon Taff	20%	23%	58%
South Gloucestershire	10%	28%	62%
Vale of Glamorgan	17%	27%	57%
Torfaen	19%	26%	55%
Total Study Area	17%	25%	58%
Wales	17%	26%	58%
England and Wales	16%	26%	58%

Source: ONS (2016) Annual Population Survey

### C.4.3 Physical activity

Data on levels of physical activity are not available at local authority level, but data from the National Survey for Wales<sup>17</sup> indicates that 32% of the population of Wales do less than 30

<sup>17</sup> This is a large-scale survey of adults in Wales, covering a range of topics such as wellbeing and people's views on public services. Data presented here is from the period April 2016 to March 2017. National Survey for Wales (2017): 'Results viewer'.

minutes of moderate to vigorous physical activity (MVPA) per week, 14% do between 30 and 150 minutes and 54% do the recommended 150 minutes per week.

Among households classified as being in deprivation, a higher percentage (41%) do less than 15 minutes per week and less people from this group do more than 150 minutes per week (47%). Physical activity also tends to decrease with age. Men are also slightly more physically active than women: 57% of men do more than 150 minutes of MVPA per week, compared to 51% of women.

#### C.4.4 Obesity

Data on levels of obesity are not available at local authority level, but data from the National Survey for Wales indicates that 59% of the population of Wales have a BMI that indicates that they are overweight or obese. Certain groups are more likely to be overweight or obese, for example 65% of men, compared to 53% of women have a BMI that puts them in this category. Those people classified as living in deprivation are also more likely to have a high BMI – 63% compared to 58% of those not living in material deprivation.

### C.5 The local context

#### C.5.1 Population needs assessments

The Social Services and Well-being (Wales) Act 2014 introduced a duty for local authorities and Local Health Boards to prepare and publish an assessment of the care and support needs of the local population. This has largely been in the form of regional population needs assessments. This summary provides an overview of the key health challenges and priorities within the Cardiff Central Region and South Gloucestershire, using information taken from these regional population needs assessments.<sup>18</sup>

##### C.5.1.1 Key health challenges

There are a number of health challenges that are common across the region, including demographic change and deprivation. The population of the region is increasingly ageing (Cardiff, Vale of Glamorgan, and South Gloucestershire) which is especially problematic due to the rural nature of some local authorities, for example South Gloucestershire and the Vale of Glamorgan. An ageing and largely rural population creates problems in terms of accessing local services and facilities, as well as increasing the risk of negative health problems associated with social isolation and loneliness. An ageing population is also highlighted as a key challenge in the Vale of Glamorgan, Cardiff, Merthyr Tydfil, Bridgend and Rhondda Cynon Taf. A number of local authorities also highlight other demographic changes as key health challenges for the future; in Newport there are a large and increasing number of people from BAME backgrounds and in Torfaen there are a significant number of people from travelling communities.

Deprivation is high across the region, and is largely caused by high unemployment rates, high numbers of people living in low income families and poor access to housing. Unemployment and low income was noted as a key health challenge in six of the local authorities (Blaenau

<sup>18</sup> The regions are as follows: Gwent (including the local authorities of: Blaenau Gwent, Caerphilly, Newport, Torfaen and Monmouthshire): Greater Gwent Health, Social Care and Well-being Partnership (2016) Population Needs Assessment Gwent Region Report; Cardiff and the Vale of Glamorgan: Cardiff and the Vale of Glamorgan Integrated Health and Social Care Partnership (March 2017) Population Needs Assessment; Merthyr Tydfil and Rhondda Cynon Taf: Merthyr Tydfil and Rhondda Cynon Taf Local Authorities and Cwm Taf University Health Board (2017) Population needs assessment; Bridgend: Bridgend Public Services Board (2017) Assessment of local well-being; and South Gloucestershire: South Gloucestershire Council (2016) South Gloucestershire Joint Strategic Needs Assessment.

Gwent, Vale of Glamorgan, Cardiff, Caerphilly, Bridgend, and South Gloucestershire). Lack of affordable and suitable housing is also a key contributor to health challenges, including causing excess deaths and general poor health in three authorities (Vale of Glamorgan, Cardiff and South Gloucestershire). This is a particularly challenge among the rising homeless population in the local authorities of South Gloucestershire and Cardiff. Poor lifestyle, including obesity, smoking and drinking to excess, are also key health challenges within the region, particularly in Cardiff, the Vale of Glamorgan and Caerphilly. Deprivation and the associated negative impacts are having a particularly negative impact on young people in Vale of Glamorgan and South Gloucestershire, with educational attainment lower for children from deprived backgrounds. There is also a high conception rate in some areas, particularly in Bridgend, among people under 18.

#### C.5.1.2 Key health priorities

A number of these challenges directly translate into the key health priorities for the region. Early intervention and providing better information, support and advice to vulnerable groups (particularly children, older people, disabled people and carers) is a key priority raised by all local authorities. This includes integrating and joining up services, as well as making support more personal to individual circumstances. Working closely with community organisations and ensuring that social, environmental and physical infrastructure is in place to support everyone within the region is also highlighted as central to improving health outcomes (Vale of Glamorgan, Cardiff, and Bridgend).

Tackling the underlying factors causing health problems, such as unemployment, low income, poor education and lack of housing is also a key priority for nine of the local authorities (Blaenau Gwent, Vale of Glamorgan, Cardiff, Caerphilly, Newport, Bridgend, South Gloucestershire, Torfaen and Monmouthshire). They acknowledge that intervention to tackle deprivation is likely to positively contribute to preventing associated health problems. Improving environmental factors, such as air quality, is also a key priority for four local authorities (Vale of Glamorgan, Cardiff, Bridgend, and South Gloucestershire).

There is also a focus on ensuring that a wider view of what constitutes good health is adopted. As well as physical health, this should include mental and emotional wellbeing, and supporting people to live independently. Raising awareness and understanding of mental health and disability is a key priority for five local authorities (Blaenau Gwent, Caerphilly, Newport, Torfaen, and Monmouthshire).

## D. Health impact evidence review

### D.1 Introduction

This section provides a summary of the findings from the literature review and has been structured around the key health determinants and resulting impacts on the local community and metro users. The main linkages between the potential determinants of health that are likely to be affected by the South Wales Metro scheme are summarised. This is not intended to be an exhaustive literature review, but identifies some of the evidence that links the scheme and potential health impacts.

### D.2 The Physical Environment

#### D.2.1 Air quality

There is a direct relationship between health, air quality and transport infrastructure<sup>19</sup>. The UK Air Quality Objectives (transposed from European Union Directives) are based on health-related thresholds for pollutants such as nitrogen dioxide and particulate matter. Research undertaken by the Royal College of Physicians estimates that 40,000 deaths every year in the UK are attributable to exposure to outdoor air pollution<sup>20</sup>.

The health risks associated with air pollution apply to the whole population, although unborn babies, children, older people and those with existing medical conditions are particularly affected<sup>21</sup>. The British Lung Foundation (BLF) notes that babies who are exposed to air pollution in the womb are more likely to suffer problems with lung development.<sup>22</sup> High levels of air pollution can also lead to premature birth and low birth weight. Existing health problems<sup>23</sup> can also be exacerbated by decreases in air quality. The BLF notes that children are more vulnerable to breathing in polluted air than adults.<sup>24</sup> A guide published by DEFRA<sup>25</sup> also highlights that older people are more likely to suffer from heart and lung conditions and therefore be disproportionately negatively impacted by reduced air quality.

Poor air quality has been shown to be linked to increases in certain health conditions. Exposure to airborne pollutants is a cause of chronic obstructive pulmonary disease (COPD).<sup>26</sup> In the UK, it is estimated that 1.2 million live with a diagnosed COPD, and, after asthma, is the second most common lung disease in the UK.<sup>27</sup> Poor air quality also contributes to the risk of developing other respiratory and cardiovascular health problems, or the worsening of existing health problems such as asthma, or lung cancer<sup>28</sup>. A survey by Asthma UK found that 42% of people with asthma avoided congested areas and 66% felt that traffic fumes exacerbated their

<sup>19</sup> World Health Organisation (2013): 'Review of Evidence on Health Aspects of Air Pollution - REVIHAAP Project: Technical Report'.

<sup>20</sup> Royal College of Physicians (2016): 'Every breath we take: the lifelong impact of air pollution'.

<sup>21</sup> Faculty of Public Health (2013): 'Transport and Health: A Position Statement'; Cowie, H. et al., (2015): 'Air Quality, Health, Wellbeing and Behaviour'.

<sup>22</sup> British Lung Foundation (date unknown): 'How air pollution affects your children's lungs'.

<sup>23</sup> Such as asthma, pneumonia, wheezing and coughs.

<sup>24</sup> British Lung Foundation (date unknown): 'How air pollution affects your children's lungs'.

<sup>25</sup> Department for Environmental Food and Rural Affairs (2013): 'Guide to UK Air Pollution Information Resources'.

<sup>26</sup> An umbrella term for lung diseases including chronic bronchitis.

<sup>27</sup> British Lung Foundation (2010): 'Chronic obstructive pulmonary disease'.

<sup>28</sup> Public Health England (2010): 'The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom'.

symptoms<sup>29</sup>. Local air quality has an evidenced effect on human health and this has been shown to influence people's behaviour<sup>30</sup>.

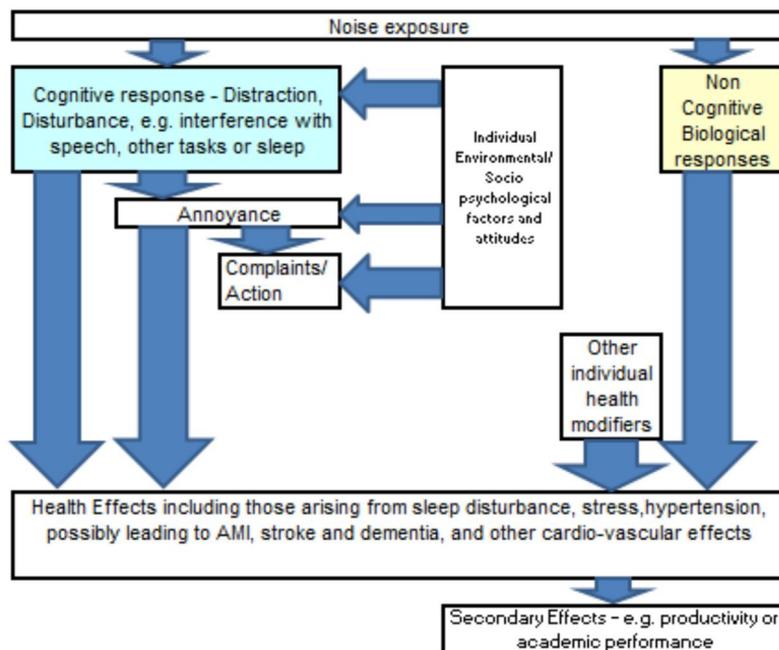
Improving bus services, including park and ride, and improvements to rail is likely to result in reducing the amount of traffic on roads. A combination of this and the proposed electrification works are also likely to lead to reduced air emissions and improved air quality.

### D.2.2 Noise

Sources of noise form part of the local environment and have a general influence on health and wellbeing. Excessive or disruptive noise has the potential to cause a variety of short and long-term health impacts, and can negatively interfere with people's day-to-day activities and discourage active travel<sup>31</sup>. Noise pollution has become a leading environmental nuisance within Europe, with around 40% of the population in EU countries experiencing noise levels above 55db(A)<sup>32</sup>. The Welsh Government recently stated that approximately 1,300 deaths and 13,500 lost life-years are attributed annually to air pollution<sup>33</sup>.

The pathway from noise exposure to health impact is more complex than for most health impacts, due to the fact that individuals are aware of the impact as it occurs, and the type of noise and experience of hearing it differs between individuals<sup>34</sup>. Defra have produced a flow diagram that clearly presents this pathway (Figure 13).

**Figure 13: Noise health pathway**



Source: Department for Environment, Food and Rural Affairs (2014)

<sup>29</sup> Asthma UK (2010): 'What is asthma'.

<sup>30</sup> Cowie, H. et al., (2015): 'Air Quality, Health, Wellbeing and Behaviour'.

<sup>31</sup> Greater London Authority (2015): 'Health impact of cars in London'.

<sup>32</sup> World Health Organisation (2011): 'Burden of disease from environmental noise'.

<sup>33</sup> Welsh Government (2016): 'Local air quality and noise management in Wales'.

<sup>34</sup> Health Protection Agency (2010): 'Environmental Noise and Health in the UK'.

Exposure to noise has been shown to cause type two diabetes, tinnitus, sleep disturbance, annoyance, stress, hypertension and cardiovascular disease<sup>35</sup>. There are also secondary effects such as cognitive impairment, particularly in children<sup>36</sup>. Those most at risk include those with underlying health problems, those with learning disabilities<sup>37</sup> and those who are most likely to have their sleep interrupted, such as night shift workers.

A reduction in levels of noise emissions, therefore, could positively benefit those most at risk of health conditions related to noise levels (including those with underlying health problems or learning disabilities<sup>38</sup> and those who are most likely to have their sleep interrupted, such as night shift workers).

## D.3 Physical infrastructure

### D.3.1 Community severance

Community severance occurs when transport infrastructure or motorised traffic divides space and people, inhibiting access to goods, services or people.<sup>39</sup> Barriers to mobility affect people's wellbeing, due to detours, delays, perceived danger, exposure to noise and air pollution, visual intrusion, and loss of sense of place. Individuals may then avoid severance by changing their behavior, including reduction in number of trips, use of different destinations or travel modes, and route diversion.<sup>40</sup> This can lead to a deterioration in health because of decreasing independence and general effects on daily life (including reduced social contact), and reduced use of active travel.

The change in access during the construction period could lead to reduced access to some services, such as education and healthcare facilities, for some members of the public.<sup>41</sup> This has the potential to lead to emotional stress, through reduced access to facilities of importance, as well as potentially leading to health problems going unaddressed.<sup>42</sup> This is likely to particularly impact people from groups with lower socio-economic status due to the reduced likelihood of people from these groups having access to other transport modes, meaning there is the potential for increased health inequalities. Community severance could also lead to poorer access to social networks and limit social contact between local communities.<sup>43</sup> There is lots of evidence to suggest a link between social contact and good health. For example, Age UK research<sup>44</sup> indicates that physical isolation, a lack of social resources and a removal of familiarity can all contribute to health problems.

Works undertaken during the construction period could also lead to a shift to motorised road transport and a reduction in active travel, as well as increased levels of construction traffic. This

<sup>35</sup> Babisch, W. (2013): 'Exposure-response curves of the association between transportation noise and cardiovascular diseases - an overview'. *First International Congress on Hygiene and Preventative Medicine*; M. Basner. et al., (2014): 'Auditory and non-auditory effects of noise on health.' *The Lancet*, 12(383), pp. 1325-1332; M. Basner et al., (2015): 'ICBEN review of research on the biological effects of noise 2011-2014'. *Noise and Health*, 17(75), pp. 57-82.

<sup>36</sup> World Health Organisation (2011): 'Burden of Disease from Environmental Noise'. M. Basner et al., (2015): 'ICBEN review of research on the biological effects of noise 2011-2014'. *Noise and Health*, 17(75), pp. 57-82.

<sup>37</sup> SEN Magazine (2017): 'Hearing, learning and Down's syndrome'.

<sup>38</sup> SEN Magazine (2017): 'Hearing, learning and Down's syndrome'.

<sup>39</sup> Mindell, J. and S. Karlsen (2012): 'Community severance and health: what do we actually know?'

<sup>40</sup> Anciaes, P. et al., (2015): 'Community severance: where is it found and at what cost?'

<sup>41</sup> Mindell, J. and S. Karlsen (2012): 'Community severance and health: what do we actually know?'

<sup>42</sup> Mindell, J. and S. Karlsen (2012): 'Community severance and health: what do we actually know?'

<sup>43</sup> Hart, J. and G. Parkhurst (2011): 'Driven to excess: Impacts of motor vehicles on the quality of life of residents of three streets in Bristol UK'. *World Transport Policy & Practice*, 17 (2). pp. 12-30.

<sup>44</sup> Age UK (date unknown): 'Loneliness and isolation evidence review'.

could have negative impacts on physical health<sup>45</sup>, with evidence suggesting that insufficient physical activity can lead to poor health outcomes. Evidence from the Lancet<sup>46</sup> estimates that physical activity is having a major negative impact on global deaths and major disease, including coronary heart disease, type two diabetes, and breast and colon cancer. Researchers estimate that lack of exercise could be responsible for around one in ten cases of heart disease (10.5%) and just under one in five case (18.7%) of colon cancer in the UK.<sup>47</sup> If inactivity were not eliminated, but decreased by 25%, more than 1.3 million deaths could be averted every year and it is estimated that elimination of physical activity would increase life expectancy of the world's population by 0.68 years.<sup>48</sup> Physical activity levels decline with age; in Wales, people who are aged 65 and above have less than half the physical activity levels of 16 to 34 year olds.<sup>49</sup> Those in the most deprived population quintile in Wales are less than half as likely to take part in physical activity as those in the least deprived quintile.<sup>50</sup>

### D.3.2 Housing demolition

There are no plans to demolish housing or relocate individuals as part of the South Wales Metro scheme. The desire to avoid demolishing residential housing is an influencing factor in the design of the scheme, because of the negative impacts this can cause on individuals and communities. This is the reason that this health determinant is covered here.

The decision to demolish housing has a major impact on residents and the wider community, with some groups more likely to be affected (i.e. older people, people with existing health conditions, children and those on low incomes). The security and quality of housing are significant for an individual's long-term health and prospects.<sup>51</sup>

Lack of control and involvement in the decision-making process has been found to have negative effects on mental health. This is because demolition and relocation have been linked to an increase in stress, anxiety and depression.<sup>52</sup> This particularly occurs for residents who are forced to move to another area. Following relocation, it can also be difficult to find alternative accommodation and such accommodation can often be located at a distance, and in an area with a limited public transport network. This can lead to inconvenience and social isolation.<sup>53</sup> This has been found to have a particularly negative impact on older people. The loss of long-standing community links can create feelings of isolation, particularly amongst older people. Age UK research<sup>54</sup> indicates that physical isolation, a lack of social resources and a removal of familiarity can all contribute to health problems.

### D.3.3 Traveller stress

Stress whilst travelling can be affected by construction works. The Design Manual for Roads and Bridges (DMRB)<sup>55</sup>, considers that driver stress has three components: frustration, fear of potential accidents and route uncertainty. These three components can also be applied to users

<sup>45</sup> Hart, J. and G. Parkhurst (2011): 'Driven to excess: Impacts of motor vehicles on the quality of life of residents of three streets in Bristol UK'. *World Transport Policy & Practice*, 17 (2). pp. 12-30.

<sup>46</sup> Lee, IM., et al (2012): 'Effects of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy'.

<sup>47</sup> Booth, F., et al (2012): 'Lack of exercise is a major cause of chronic disease'.

<sup>48</sup> Lee, IM., et al (2012): 'Effects of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy'.

<sup>49</sup> Welsh Government (2013): 'Welsh Health Survey, 2012'.

<sup>50</sup> Sustrans (no date): 'Physical activity and health: facts and figures'.

<sup>51</sup> JRF (2017): 'Poverty after housing costs by housing tenure'.

<sup>52</sup> UCL (date unknown): 'Refurbishment and demolition of housing: health and wellbeing factsheet'.

<sup>53</sup> Defra/ Environment Agency flood and coastal erosion risk management R&D programmes (2005): 'The impact of flooding on rural and urban communities'.

<sup>54</sup> Age UK (date unknown): 'Loneliness and isolation evidence review'.

<sup>55</sup> DMRB volume 11, section 3, part 9.

of public transport. Frustration is caused by feelings of loss of control. This may be due to delays making people's journeys longer or more crowded. Route uncertainty is caused by inadequate information about potential delays and changes to routes and / or timetables.

Stress has the potential to increase a traveller's allostatic load, which has the potential to exacerbate hypertension, cardiovascular disease and mental health issues such as anxiety.<sup>56</sup> The groups who are most at risk are those already experiencing elevated levels of stress, and those that undertake large amounts of travelling. Improving service provision is likely to positively benefit these groups through improving health outcomes.

Research also suggests that people who drive to work are more stressed than people who travel by train and / or cycle / walk.<sup>57</sup> During the construction period, there is the potential for major delays on the rail service, so people may choose to use alternative modes of transport. This could cause increased stress and associated negative impacts on mental and physical health.

During the operational stage, improvements to reduce journey times for people are likely to lead to greater mobility of the population and improve mental and physical health. Evidence from the Annual Population Survey<sup>58</sup> showed that people who travel longer distances to work are likely to have lower life satisfaction, a lower sense that daily activities are worthwhile, and lower happiness levels on average. For example, people commuting more than 30 minutes a day by train had higher anxiety levels on average, meaning reduction in journey times is likely to reduce stress and improve mental health.

#### D.3.3.1 Accessibility to the infrastructure

Improving accessibility on public transport is likely to have significant impacts on the local population, particularly those in rural areas or areas that are currently disconnected from public transport. It can particularly benefit vulnerable groups including disabled and older people. Inaccessible infrastructure can act as a significant barrier for people in wheelchairs and individuals with sight and mobility impairments, potentially creating additional distances for these users to travel to use public transport.<sup>59</sup> Older people are more likely than other sections of the population to have mobility impairments and therefore require accessible infrastructure. The presence of steps can act as a barrier for older people; NHS data indicates that 62% of fatal falls in those aged 65 and over are on or from stairs or steps.<sup>60</sup>

Improving access is likely to lead to greater mobility of the population, as well as improving health, mental and physical wellbeing. The Institute of Public Policy Research (IPPR) estimates that nationally, almost one in five over 75 year olds say that they 'felt lonely much of the time during the last week'. The report also suggests that more than one million older people feel trapped in their own home.<sup>61</sup> Furthermore, a report by disability charity, Sense, found that over half of disabled people (53%) report of feeling lonely. Common barriers to reducing social isolation were problems with mobility and being able to get to community facilities.<sup>62</sup>

Improving access to the Metro network will not only enable more people to use the network, it will enable greater accessibility to a wide range of facilities, public services including healthcare,

<sup>56</sup> Charles, S. et al., (2013): 'The Wear and Tear of Daily Stressors on Mental Health'.

<sup>57</sup> Wener, R. and G. Evans (2011): 'Comparing stress of car & train commuters', Transportation Research Part F, 14: 111-116.

<sup>58</sup> Annual population Survey (2013)

<sup>59</sup> Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'.

<sup>60</sup> Health Promotion England (date unknown): 'Older people and accidents'.

<sup>61</sup> IPPR (2011): 'Million older people suffering social isolation and loneliness'.

<sup>62</sup> Sense (2015): 'A right to friendship?'

employment opportunities, and social connections. This will have beneficial impacts on health and wellbeing.

#### D.3.3.2 Access to services and healthcare

The ability of individuals to access services including healthcare is fundamental to health and wellbeing<sup>63</sup>. Vulnerable groups often find access, including transport to healthcare sites, challenging<sup>64</sup>. Therefore, improving public transport provision is likely to improve access to healthcare and positively benefit health outcomes.

### D.4 Socio-economic conditions

#### D.4.1 Generation of employment

There is substantial evidence showing that employment improves health and wellbeing, and health and wellbeing improve employment chances<sup>65</sup>. This is because having a job gives people a purpose, promotes independence, facilitates social participation and helps to prevent physical and mental health problems. Unemployment can cause loss of self-esteem, loss of social contacts and can cause mental health problems such as depression and anxiety<sup>66</sup>.

The benefits of employment are due in part to the benefits of work itself, out weighing workplace risks<sup>67</sup>. This is related to the connection between health, income and class<sup>68</sup>. Access to employment is important as to experience the benefits of employment in most cases it is still necessary to attend a place of work. This physical access to work has been identified as a potential barrier to employment<sup>69</sup>, particularly for young people seeking work<sup>70</sup>.

<sup>63</sup> World Health Organisation (2008): 'Closing the Gap in A Generation: Health equity through action on the social determinants of health'.

<sup>64</sup> Hamer, L., (2004): 'Improving patient access to health services: a national review and case studies of current approaches'.

<sup>65</sup> World Health Organisation (2008): 'Closing the Gap in A Generation: Health equity through action on the social determinants of health'.

<sup>66</sup> Noordt, M., et al (2014): 'Health effects of employment: a systematic review of prospective studies'. *Occupational and Environmental Medicine*, Volume 71, pp. 730-736.

<sup>67</sup> Waddell, G. and K. Burton (2006): 'Is Work Good for your Health and Wellbeing'.

<sup>68</sup> Benzeval, M. et al., (2014): 'How Does Money Influence Health?'; Marmot, M., (2010): 'Fair Society, Healthy lives'; Allmark, P. and M. Grimsley (2010): 'Chapter 4: Socio-economic status or class. In: *Equality and Human Rights Commission: Evidence analysis for the triennial review: Lot 1 - Life and Health Key messages*'.

<sup>69</sup> Department for Transport (2011): 'Creating Growth, Cutting Carbon Making Sustainable Local Transport Happen'.

<sup>70</sup> Siraj, I. et al., (2014): 'Report on students who are not in Education, Employment or Training (NEET)'.

## D.4.2 Lifestyle

### D.4.2.1 Physical activity

Regular physical activity contributes to good health and wellbeing and can reduce the risk of several chronic conditions such as coronary heart disease, type 2 diabetes, obesity, cancer, mental health conditions and musculoskeletal conditions. In addition, those who are physically active are less likely to develop dementia, especially vascular dementia<sup>71</sup>.

The provision of transport to improve accessibility has a large role to play in facilitating physical activity.<sup>72</sup> One component of a healthy lifestyle is meeting the recommended amount of physical activity – 30 minutes of medium / moderate exercise five times per week<sup>73</sup>. It is estimated that one in every 11 early deaths could be prevented by undertaking the recommended amount of physical activity<sup>74</sup>. The National Institute for Health and Clinical Excellence (NICE) issued guidance that makes explicit the relationship between the physical environment and physical activity, providing advice on how to create physical environments that encourage greater physical activity<sup>75</sup>. Public transport improvements are also likely to encourage physical activity through improved access to leisure and sporting facilities.

### D.4.2.2 Access to green space

Improving access to green space is likely to have a positive impact on both mental and physical health. There is clear evidence that access to green spaces (such as parks, woodland and other open spaces) can improve health. The Department for Health 'Healthy lives, healthy people' frequently refers to access to green space as an influencer on the health and wellbeing of communities.<sup>76</sup>

A study found that having green space within 1km (rather than 3km) from your home reduced the prevalence of certain diseases.<sup>77</sup> The presence of green space also has indirect benefits, such as providing space for physical activity and play, reducing obesity, and improving air quality. Evidence also suggests that living near green spaces is associated with fewer low birth weight babies.<sup>78</sup> The Marmot review<sup>79</sup> also highlights the importance of quality green space, pointing out that some groups, including children, can feel excluded if spaces are not designed appropriately and that poor maintenance or cleanliness can impact more widely on perceptions of safety.

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<sup>71</sup> Public Health Wales (2014): 'Physical activity: Introduction'.

<sup>72</sup> Faculty of Public Health (2013): 'Transport and Health: Briefing Statement'.

<sup>73</sup> NHS (2011): 'Physical activity guidelines for Adults (19–64 years)'.

<sup>74</sup> Primarolo, D., (2010): 'Speech to the Local Government Association: Sport and Physical Activity'.

<sup>75</sup> National Institute for Clinical Excellence (2008): 'Public health guidance: Promoting and creating built or natural environments that encourage and support physical activity'.

<sup>76</sup> Department for Health (2010): 'Healthy lives, healthy people: our strategy for public health in England'.

<sup>77</sup> NCB (2012): 'Environmental inequalities and their impact on the health outcomes of children and young people'.

<sup>78</sup> Dadvand, P. et al., (2014): 'Inequality, green spaces, and pregnant women'.

<sup>79</sup> Marmot Review Team (2011): 'The health impacts of cold homes and fuel poverty'.

