1. PROJECT INFORMATION

Project Title	Improving the targeting of NHS Health Checks towards patients with undiagnosed Long Term Conditions

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2. PURPOSE OF THIS PROJECT

This project aims to contribute towards increasing diagnoses of cardiovascular conditions in the Tilbury locality via targeting NHS Health Checks more effectively towards those with the highest cardiovascular risk.
It should be noted that this project has an interdependency with the *stretched QOF* project, as increased diagnoses of conditions may receive more effective care management under the stretched QOF principles.

3. NEEDS ASSESSMENT

Making the Case for Improving Case-Finding of undiagnosed CVD

The needs assessment[i] completed for the Tilbury ACO work showed that there is a large number of patients likely to have a long term condition, but who have not yet been diagnosed. The table below shows this for cardiovascular-related conditions using 2015/16 QOF data on diagnosed patients, and PHE 2016 modelled estimates for the total number of expected patients.

Condition	Observed number of patients	Total estimated number of patients	Tilbury Locality 'Register Completeness'	Additional Number of Undiagnosed Patients based on the estimated prevalence
Stroke	650	1,398	46.5%	748
Hypertension	5,782	7,977	72.5%	2,195
CHD	1,141	2,790	40.9%	1,649
Peripheral Arterial Disease	193	399	48.4%	206

Whilst register completeness and case-finding varies widely across the locality area, the above information indicates there is a substantial opportunity for improvements to detection of CVD,

even accounting for the fact that some patients may have multiple conditions.

Multiple Regression Analysis modelling by the Thurrock Public Health Team shows that in Tilbury practice populations, for each 10 additional people that we diagnose with Hypertension we prevent 1 stroke every 3 years . If this assumption were to be applied to Tilbury, this equates to 220 preventable strokes over the next three years which would save the NHS £4803K and Adult Social Care £930K. Identifying and treating patients with high blood pressure is therefore both highly cost effective and will significantly reduce stroke risk.

In addition, patients who have had a stroke or TIA are ten times more likely to have another stroke compared to someone of the same age without a history of a stroke. It is therefore extremely important to diagnose and clinically manage patients with undiagnosed stroke/TIA.

Whilst Tilbury-level data is not available for the current levels of case-finding for Diabetes, Thurrock-level estimates indicate that the expected prevalence of Diabetes should be 7.9%. Comparing this to the current observed prevalence of Diabetes in Tilbury [7.4%] gives an estimated 'register completeness' of 93.7%. This would give an additional 141 undiagnosed Diabetes patients in Tilbury. However this figure should be viewed with caution as it is calculated applying a Thurrock-level estimated prevalence to local GP data.

Making the Case for targeting Health Checks towards detecting undiagnosed CVD

The needs assessment provided some information on the current uptake of Health Checks in the Tilbury locality. It should be noted that this information did not include data for one Tilbury practice – Sai Medical Centre, due to its use of a different system. Across the seven included Tilbury practices, there were 830 patients who completed a Health Check in 2015/16. However, separate subsequent analysis of Sai Medical Centre's data found that they had completed 37 Health Checks (source: Thurrock Council PH Performance Report), giving a Tilbury total of 867.

The data in the needs assessment stated that 1,351 were invited, resulting in an uptake rate of 61.4%, which was higher than the Thurrock uptake of 56.7%. There is however an amount of variation within the locality, with uptake ranging from 30.0% (Dr Suntharalingham) to 84% (Dr Shehadeh).

Profile of those completing Health Checks

Looking at the demographic characteristics of those completing Health Checks in Tilbury, it can be seen that 55.9% were female and 44.1% male. The age breakdown is shown below, depicting that higher proportions of checks were completed in the younger age groups. It is worth considering that the NHS Health Check programme has been in operation now for 7 years, meaning that older patients should have been aware of it and invited previously. [Note this does not include the 37 Sai Medical centre patients as the demographics of those were not known]

Age band	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	65-69 years	70-74 years	Grand Total
Number of patients	203	176	184	121	68	50	28	830

% of total	24.46%	21.20%	22.17%	14.58%	8.19%	6.02%	3.37%	100.00%

The outcomes of Health Checks at Tilbury level is largely unknown, as the most robust data recording centres around the national targets which concentrate on invites and uptake. However, applying national modelled estimates of post-check diagnoses allows us to approximate the number of diagnoses made after the 867 Health Checks were completed in 2015/16.

Assuming that 1 in 27 of those who had a Health Check had a hypertension diagnosis afterwards [from national estimates], in Tilbury this would equate to 32 patients diagnosed with hypertension from this process.
Assuming that 1 in 110 of those who had a Health Check had a Diabetes diagnosis afterwards, in Tilbury this would equate to 8 patients diagnosed with Diabetes from this process.
And assuming that 1 in 250 of those who had a Health Check had a Chronic Kidney Disease diagnosis afterwards, in Tilbury this would equate to 4 patients diagnosed with CKD from this process.

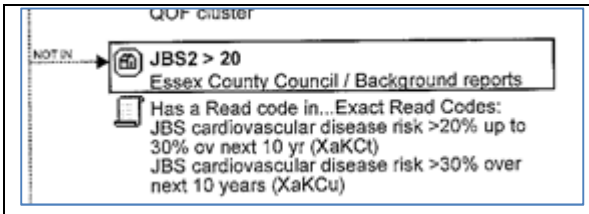
If we simply increased the number of completions in Tilbury with the above level of impact on case-finding, it would not have a significant impact on the estimated levels of undiagnosed long term conditions shown above. For example, in order to diagnose 100 additional hypertension patients, you would have to complete checks for 2,700 patients.

What the above suggests is that current uptake of the HC program in Tilbury is good and therefore the proposal does not seek to increase overall uptake. However, it would benefit from further targeting to identify undiagnosed LTC patients, as current estimates of diagnoses indicate they need to be more effective at finding high-risk patients.

Project Overview

Currently, the invite list for each GP is determined using the Systm One report with the below criteria:

This current report, whilst very targeted already towards the eligible population [and recognised by PHE as appropriate for calculating the eligible population figures], does not particularly target those within the group likely to have the highest risk, rather it excludes those with the highest registered CVD risk, assuming that they are likely to be known and receiving treatment already. *What this demonstrates, is that the functionality to create the QRISK2 score is possible before the Health Check is performed.*



This project proposes another report to be designed to prioritise those *within* the defined eligible population from the report criteria above, with the highest CVD risk as calculated using the QRISK2 algorithm [>10%], and focus on ensuring they are invited to and complete a Health Check. This population would also be the main focus for follow up calls/letters to reduce likelihood of DNAs and to ensure outcomes following the Health Check can be tracked. Amendments to the agreed activity data metrics with the Health Check provider may need to be agreed to ensure Tilbury data can be separated from pan-Thurrock.

It is hoped that this report could be written within the future Mede Analytics software package, once GP data is incorporated within, although it may have to start within Systm One. This is subject to the roll out timetable of the integrated data solution.

4. EVIDENCE BASE

<u>Characteristics of populations with undiagnosed cardiovascular conditions</u>

There is some evidence available to profile those more likely to have their long term conditions go undiagnosed. A study by Kanungo *et al* (2017)[ii] which looked at the patterns and predictors of undiagnosed patients in India found that significant predictors were being a younger age, lower income and poor education level. Youth as a predictor for undiagnosed hypertension is also supported by Johnson *et al* (2014)[iii] who found that 18–31-year-olds had a 33% slower rate of receiving a diagnosis compared with adults at least 60 years. Other predictors of a slower diagnosis rate among young adults were current tobacco use (24% slower rate), white ethnicity, and non-English primary language (41% slower rate than those whose primary language was English). Interestingly, this study was undertaken in a population that had regular interaction with primary care, so it could not be assumed that the younger age groups had less opportunity for diagnosis as they were frequent attenders at primary care settings.

It is also well-evidenced that hypertension and presence of obesity are predictors of undiagnosed Diabetes, with some research[iv] also indicating that males were an independent predictor.

Relating this to Tilbury, the population of Tilbury is generally younger than England, meaning there are proportionally more at the lower end of the age band eligible for Health Checks than the higher end. It also has higher rates of smoking and obesity, and populations living in more deprived areas. This indicates that this population would benefit greatly from interventions to increase diagnoses.

<u>Coverage of the NHS Health Check</u>

NHS Health Checks are offered for those aged 40-74 years inclusive without a pre-existing long term condition. The aim of the programme is both to identify patients with undiagnosed long term conditions and those with lifestyle or clinical biomarkers that put them at increased risk of

developing a long term condition in the future.

Information taken from the recent national evaluation on NHS Health Checks undertaken by the Expert Scientific and Clinical Advisory Panel (2017)[v] indicates that studies consistently report higher coverage among older people, individuals from the poorest communities, and people with a family history of coronary heart disease. Additionally, the national studies also show greater coverage among Bangladeshi, Caribbean and Indian ethnic groups than among white individuals and lower coverage among Chinese groups. It also appears that coverage is also generally higher in women, unless a targeted approach to prioritise people at higher CVD risk is used. This appears to demonstrate that, nationally at least, NHS Health Checks are reaching people with the greatest risk of CVD.

This relates to what is being seen locally, with Tilbury [containing a number of deprived GP practices] seeing a higher coverage rate than the rest of Thurrock [61.4% compared to 49.4% across Thurrock], and more women than men accessing Health Checks [55.9% women compared to 44.1% men]. The national picture on age however is not seen here, perhaps due to the slightly younger demographic of Tilbury residents.

Effectiveness of the NHS Health Check in increasing diagnoses of LTCs

National evidence shows that the detection of disease is significantly more frequent among NHS Health Check attendees compared to non-attendees for:

- Chronic kidney disease.
- Familial hypercholesterolemia.
- Hypertension.
- Peripheral vascular disease.
- Type 2 diabetes.

A small but significant decrease in stroke was also reported in one study, showing promising signs that the programme may already be having an impact on prevention.

However, there is a marked absence of research on the impact of NHS Health Checks on lifestyle behaviours. One study found that there was no significant change in the prevalence of smoking two years after having an NHS Health Check. It seems that there is considerably more to be done to understand the impact of the programme on lifestyle.

Research using national data and comparing NHS Health Check attendees with matched non-attendees reports favourable changes among people having a check on:

- Blood pressure.
- Body mass index.
- Modelled CVD risk.

What is less clear is the size of the effect the programme has on preventing heart attacks and strokes. Estimates so far range from preventing 250 – 500 events each year assuming that 1.2 million checks are completed.

This indicates that the NHS Health Check is likely to have had an effect on increasing diagnoses locally, and as the Tilbury locality already has a high uptake, this may be seen more so there than

other areas.

Improving Targeting of Health Checks towards those at greatest risk of CVD

A recent study by Crossan *et al* (2017)[vi] considered whether screening those with the highest CVD risk only was most cost effective than universal Health Checks to all those eligible. Their research found that ranking patients by prior risk estimate – completed remotely using the QRISK2 algorithm [taking into account variables such as age, sex, ethnicity, blood pressure, smoking status], and undertaking CVD screening in the 8% who have got the highest prior risk [10 year risk of ≥12.76%], yielded 17.53 QALYs with a cost per QALY of £9,257.27 [anything below £20,000 is considered to be cost effective as per NICE guidance[vii].] The study also recommends that it is not cost-effective to invite those with a QRISK2 score of <4.06% for a Health Check.

5. PROJECT OUTCOMES

It is expected that this programme should:

- Improve targeting of health checks so that they detect a greater % of those with undiagnosed LTCs
- Increase GP register "completeness"
- Contribute to the reduction of health inequalities between Tilbury and the rest of Thurrock
- Result in earlier diagnosis of LTCs leading to future reduced emergency admission activity for cardiovascular-related conditions

6. DELIVERY PLAN AND KEY MILESTONES

Key Milestones (Key events indicating progress)	To be reached by (date)	Who is responsible for meeting the Milestone?
Agreement of proposed approach with provider including establishment of key reporting requirements.		Public Health
New targeting report to be produced to prioritise those within the existing Systm One report who have the greatest CVD risk scores via application of the QRISK2 algorithm.		Public Health
Provider to use new targeting report to prioritise their invites and uptake activity.		Provider
Ongoing monitoring via performance meetings		Provider and Public Health

7. FINANCIALS: Costs, Resources, Cashable Benefits, Cost Avoidance, Return on Investment

*Tilbury has 22.1% of the population of Thurrock within its locality [calculated from Jan 2017

population data*

If we were to apply the assumptions from the Crosslan research to Tilbury – with an invited population in 2015/6 of 1,351, we would be only completing Health Checks in 108 patients compared to 867. This is assuming the distribution of Tilbury patients on the QRISK2 scale is the same as the study – which is unlikely as Tilbury patients are more likely to have higher scores due to poorer overall health. Even modelling a slight uplift to account for this, the completions would only be likely to increase to approximately 162 [based on 12% of the eligible population having a QRISK2 score of ≥12.76%. This would have a negative impact on the national uptake targets, and also is counter-productive for encouraging healthier lifestyle behaviours at an earlier stage.
Hence it is proposed for the project to focus more energies on ensuring those with a higher QRISK2 score receive a Health Check, but not to stop inviting and completing Health Checks for those with slightly lower scores, meaning that the expected number of completed Checks should still be similar to 867 by the end of the year.

By increasing Health Check completion amongst those most likely to have an undiagnosed long term condition, it could have the below impacts on diagnoses in Tilbury:

Hypertension
An original BCF hypertension detection paper set out to detect an additional 5,000 undiagnosed hypertensive patients over 3 years in Thurrock. Apportioning this for Tilbury would give 1,109 over 3 years or 370 per year, to be detected via a mixture of Health Checks, pharmacy workstream, care home detection and other programmes. If 1,275 of the 5,020 were to come from targeted Health Checks, apportioning this for Tilbury would give 282 over 3 years or 94 per year.
The impact of detecting an additional 94 undiagnosed hypertensive patients per year in Tilbury would improve completeness of the hypertensive register from 72.5% to 73.66%, or up to 76% over three years.

Using the current number needed to treat for Health Checks with the blanket approach to screening, to diagnose one hypertensive patient from Health Checks, you would need to screen 27 patients; meaning that if we wish to find another 94 – giving a total of 126 hypertensive diagnoses, we would need to screen 3,375 patients, which is not feasible given that there were 867 completed in 2015-16. By keeping the completion number the same (867), we are therefore assuming that by targeting those with the highest cardiovascular risk, the number needed to treat to find one hypertensive patient will be fewer – 7 patients (6.88) screened to find one hypertensive.

Stroke Prevention
Modelling work undertaken by the Public Health team specifically for the Tilbury locality area found the below associations:

Diagnosing 10 additional hypertensive patients will result in 1.049 fewer stroke admissions over a three year period.
Treating 10 additional hypertensive patients will result in 0.199 fewer stroke admissions over a three year period.

Scaling this up:

Diagnosing 282 additional hypertensive patients will result in 29.58 fewer stroke admissions over a three year period.
Treating 282 additional hypertensive patients will result in 5.612 fewer stroke admissions over a three year period.

In Tilbury, if we manage to diagnose and treat 282 undiagnosed hypertensive patients, this will prevent a total of 35.192 stroke admissions over three years.

The cost savings associated with this are [35.192 strokes x £3644] **£128,239.65** for NHS and [35.192 strokes x £4221] **£148,545.43** for Social Care over the three year period.

Taking the previous figures into account, estimating that only 32 (3.69%) of the 867 ended up being diagnosed with hypertension using the current approach to delivering Health Checks, increasing this total by 94 would give 126 (14.53%) of Health Check patients resulting in a hypertension diagnosis. In this scenario, HC diagnosis of a LTC has increased but no further increase on uptake numbers of Health Checks are needed per year.

The treatment costs for each additional yearly cohort of 94 additional hypertensive patients can be calculated using the Public Health England estimate[viii] that it costs £69 per year to control the blood pressure of the average person with hypertension – this covers the GP clinic time and anti-hypertensive drugs.

This would give the below treatment costs:

- 94 patients in year 1 - £69 x 94 = **£6486**
- 94 new patients in year 2 + 94 patients from year 1 = [£69 x 94] £6486 + [Year 1 patients annual treatment cost so another £6486] = **£12,972**
- 94 new patients in year 3 +annual treatment costs for the 94 year 1 patients and 94 year 2 patients = [£6486 + £12,972] = **£19,458**

So a total three year cost of £38,916 to manage hypertension in the 282 additional hypertensive patients.

Subtracting this from the three year savings from hospital admissions would give:

[£128,239.65 +£148,545.43] - £38,916 = £237,869.08

<u>CHD Prevention</u>
As the register completeness for CHD is very low in Tilbury, there is a lot of scope to use the Health Checks to detect undiagnosed CHD. Using the estimate of 1,649 CHD patients in Tilbury, if we manage to increase the completeness of the register by 1% from 40.9% to 41.9%, this would result in diagnosing **40 more patients** within the year, or **120** over three years.

Modelling work undertaken by the Public Health team specifically for the Tilbury locality area found the below association:

Treating 10 additional HF and LVD patients with ACE or ARB will result in 10.92 fewer CHD/HF

admissions over a three year period.

Scaling this up (and assuming we will treat all the additional CVD patients we diagnose):

Treating 120 additional HF and LVD patients with ACE or ARB will result in 131.04 fewer CHD/HF admissions over a three year period.

The cost savings associated with these reduced admissions are [131.04 admissions x £4614] = **£604,618.56** over a three year period.

Diabetes Prevention

Using the estimate of 141 additional undiagnosed Diabetes patients in Tilbury, if we manage to increase the completeness of the Diabetes register from 93.7% to 94.7%, this would result in diagnosing **22 additional patients** within the year, or 66 over three years.

The treatment cost associated with managing Diabetes for 22 additional patients could be calculated using the NICE estimate[ix] of £431 per year per patient treated on DPP-4 inhibitors [assuming that none are being treated on sulfonylureas as this is very recent NICE guidance]. This would give the below treatment costs:

- 22 patients in year 1 - £431 x 22 = **£9,482**

Note that a treatment estimate is only given for one year, as the modelled estimates indicate that the Diabetes register is near to completion, and the additional activity from the *stretched QOF* business case may also result in an increased number of diagnoses.

It is not possible to quantify the impact this would have on reducing hospital activity, as the Public Health team have not yet completed a Diabetes admissions model. However as the annual inpatient and outpatient costs per patient for Diabetes are approximately £2,485[x], it is expected that any increase in earlier diagnosis of Diabetes should enable these costs to be reduced through more effective care management.

Summary

The below table summarises the above information based on the current Health Check diagnosis activity and the modelled assumptions above.

Condition	Current Diagnoses due to Health Checks	Expected Diagnoses due to Health Checks	Additional annual Diagnoses from this programme	Expected impact on Register Completeness [one year]	Future three-year cost savings from increased Diagnoses	Treatment Costs from additional diagnoses
Hypertension	32	126	94	Increase from 72.5% to 73.66%	**£128,240** for NHS and **£148,545**	£38,916 over 3 years / £6484

					for Social Care	over one year
CHD	Unknown	Unknown	40	Increase from 40.9% to 41.9%	Unable to quantify	
Diabetes	8	30	22	Increase from 93.7% to 94.7%	£7,455 per hospital case avoided	£9,482 over one year

8a. NON FINANCIAL BENEFITS

Benefit Description	**Measure to track realisation of benefit**	**Benefit realisation timescales:**
Patient wellbeing and quality of life due to earlier detection of conditions.	?Provider satisfaction survey post-targeted Health Check	
Improvements to long term condition register completeness in GPs.	QOF reporting	Post-Health Check diagnoses may not appear on the register until up to four months after the Check has taken place.
More accurate data is captured on the highest risk patients through the Health Check process, improving commissioner knowledge of the current health status in Tilbury.	Performance data returns	

8b. POTENTIAL DIS-BENEFITS

Dis-benefit description	**Measure to track realisation of dis-benefit**	**Dis-benefit realisation timescales and mitigation**
Potential exclusion of non-high risk patients from receiving a Health Check.	Patient complaints	
National uptake targets not being reached if attention in Tilbury is diverted towards encouraging specific individuals to complete a Health Check.	Performance reports	

9. KEY RISKS TO PROJECT DELIVERY

Risk Type, Risk Level and Risk Description	Risk Mitigation	Who will monitor this Risk?
The new provider does not adopt this approach.	Regular discussions within contract meetings.	Public Health
Confusion with provider about different approach within Tilbury compared to the rest of the locality.	To be picked up in regular stakeholder meetings.	Public Health
The increased Health Check 'diagnoses' may not actually result in increased QOF entries and effective care management.	Facilitation of good relationships between Provider and GPs.	Provider/GPs/Public Health via contractual meetings

10. KEY ASSUMPTIONS AND CONSTRAINTS

ASSUMPTIONS

Assumption	What happens if assumption is no longer correct	Who will monitor the assumption
All GPs in this area would welcome this approach	The existing approach to blanket-inviting all eligible residents for Health Checks would continue, and the expected increased diagnoses would not be seen.	Public Health Provider
The new healthy lifestyles provider would welcome this approach	The existing approach to blanket-inviting all eligible residents for Health Checks would continue, and the expected increased diagnoses would not be seen.	Public Health
In accordance with the proposed approach to delivering Health Checks in Provider's tender document: - 50% Health Checks will be delivered by Provider - 25% will be delivered by GPs - 25% will be delivered by pharmacies	The approach to engagement will need to change.	Public Health Provider

Modelled estimates from the APHR work are still accurate even though some data dated.	A reduced impact on emergency admissions would be seen.	Public Health
Sufficient staff capability is present in Provider to administer the new report (understanding is that existing NELFT staff are being TUPE'd)	The existing approach to blanket-inviting all eligible residents for Health Checks would continue, and the expected increased diagnoses would not be seen.	Public Health Provider
QRISK2 functionality is active on *Health Manager* (Provider's preferred data system) and can be applied.	The existing approach to blanket-inviting all eligible residents for Health Checks would continue, and the expected increased diagnoses would not be seen.	Provider
The condition in the new service specification with Provider which stipulates that all those with a QRISK2 score of ≥10 should be subject to an annual call/recall, is honoured by the provider.	The provider would not be required by Public Health to have a focus on this group of patients.	Provider Public Health
Appropriate communications on this topic would be developed, perhaps with the support of Patient Participation Groups to encourage those who are invited to attend.	The existing approach to blanket-inviting all eligible residents for Health Checks would continue, and the expected increased diagnoses would not be seen.	Provider GPs
Diagnosis of a new LTC from the Health Check would result in inclusion on the QOF register by four months post-Check [to allow for time for subsequent GP appointment[s] to occur and diagnostic results received] and appropriate care management given.	The expected increased diagnoses would not be seen.	Public Health CCG Primary Care team
CONSTRAINTS		
Constraint	**What happens if the Constraint is no longer correct?**	**Who will monitor this Constraint?**
Provider does not use Systm One for their Health Checks, and it is unknown if their *Health Manager* data system will be interoperable by 1st April.	If the systems are interoperable, the new targeted report can be written with the QRISK2 applied.	Public Health via contractual discussions with Provider.

The 2015-16 uptake figures in this business case do not cite accurate data for Sai Medical Centre as it was not possible to gain reporting-level access to their system. Therefore assumptions have been made without their data.	The baseline uptake percentage for Tilbury may need to be changed.	Public Health – if more accurate data is provided.

11. DEPENDENCIES		
Inbound: This project is dependent on the delivery of these projects/activities		
Project/Activity	**What is the dependency?**	**Who will monitor the dependency?**
Implementation of new Integrated Healthy Lifestyles Provider from 1st April 2017.	The new provider needs to be in place by 1st April in order to work with GPs to deliver the programme and record relevant data – e.g. follow up attempts for target population etc.	Public Health
The *Health Manager* data system being interoperable with Systm One by 1st April 2017.	The new data system preferred by Provider needs to be interoperable with Systm One in order to access the patient details defined from the existing Systm One eligibility report, so that those with the highest QRISK2 can be identified.	Public Health via contracting meetings.
GP engagement.	Discussions with GPs and obtaining their agreement to the new approach to delivering targeted Health Checks.	Primary Care Team (CCG) and Public Health Healthcare Improvement Managers Provider
Outbound: Other projects or activities will not deliver if this project fails to deliver		
Project/Activity	**What is the dependency?**	**Who will monitor the dependency?**
Stroke Prevention programme	Increasing detection of hypertension has been shown to have a quantifiable impact in reducing emergency admissions for Stroke. Health Checks have been shown as a mechanism to detect	Integrated Commissioning Executive.

	hypertension, and therefore by targeting them more effectively, this should increase hypertension diagnoses and therefore reduce emergency admissions.	
Effective detection of undiagnosed long term conditions	It is quantified both above and in the 2016 Annual Public Health Report that there is a large estimated number of undiagnosed cases of disease in Thurrock. It was identified as a priority programme of work within the report, and the NHS Health Check programme is an effective way to do this.	

12. GOVERNANCE ARRANGEMENTS

It is expected that this programme will be overseen by the Tilbury ACO Steering Group, with a small operational delivery group tasked with the overall project management arrangements and holding responsibility for its delivery. This group would be made up of representatives from:

- Public Health
- CCG Primary Care team
- Practice Management
- Provider
- Pharmacy contractors {if delivering Health Checks for Provider}

13. APPENDICIES

[i] Thurrock Council Public Health Team (2017) *Needs Assessment to Support Development of an Accountable Care Organisation for Tilbury*.

[ii] Kanungo, S., Mahapatra, T., Bhowmik, K. Saha, J., Mahapatra, S., Pal, D., Roy, R., Bhadra, U.K. and Sarkar, K. (2017) Patterns and predictors of undiagnosed and uncontrolled hypertension: observations from a poor-resource setting. *Journal of Human Hypertension,* **31**, 56-65
Available from: http://www.nature.com/jhh/journal/v31/n1/full/jhh201630a.html [Accessed on 02/03/2017]

[iii] Johnson, H.M., Thorpe, C.T., Bartels, C.M., Schumacher, J.R., Palta, M., Pandhi, N., Sheehy, A.M. and Smith, M.A. (2014) Undiagnosed hypertension among young adults with regular primary care use. *Journal of Hypertension*, **32**(1), pp65-74. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3868024/ [Accessed on 02/03/2017]

[iv] Glumer, C., Carstensen, B., Sandbaek, A., Lauritzen, T. Jorgensen, T., and Borch-Johnsen, K. (2004) A Danish diabetes risk score for targeted screening: the Inter99 study, *Diabetes Care,* **27,** 727-33

[v] Expert Scientific and Clinical Advisory Panel (2017) Emerging evidence on the NHS Health Check: findings and recommendations. Available from: http://www.healthcheck.nhs.uk/commissioners_and_providers/evidence/ [Accessed on 24/02/2017]

[vi] Crossan, C., Lord, J., Ryan, R., Nherera, L. and Marshall, T. (2017) Cost effectiveness of case-finding strategies for primary prevention of cardiovascular disease: a modelling study. *British Journal of General Practice*, exx1-12.

[vii] National Institute for Health and Clinical Excellence (2013) *Judging whether public health interventions offer value for money*. Available from: https://www.nice.org.uk/advice/lgb10/chapter/judging-the-cost-effectiveness-of-public-health-activities [Accessed on 01/03/2017]

[viii] Public Health England (2016) *CVD Prevention Opportunities*. PHE Publications Gateway number 2015621

[ix] National Institute for Health and Care Excellence (2015) Resource impact report: Type 2 diabetes in adults: management (NG28). Available from: https://www.nice.org.uk/guidance/ng28/resources/resource-impact-report-2187279901 [Accessed on 07/03/2017]

[x] This is the mid-point of the estimates calculated by the London School of Economics and Diabetes UK – available from: http://www.diabetes.co.uk/cost-of-diabetes.html Accessed on 01/03/2017