Article:
Brennan, A. orcid.org/0000-0002-1025-312X, Hill-McManus, D., Stone, T. orcid.org/0000-0002-0167-3800 et al. (11 more authors) (2019) Modeling the potential impact of changing access rates to specialist treatment for alcohol dependence for local authorities in England: The Specialist Treatment for Alcohol Model (STreAM). Journal of Studies on Alcohol and Drugs (Sup 18). pp. 96-109. ISSN 1937-1888

10.15288/jsads.2019.s18.96

5 Tables, 2 Figures, 1 Appendix

Modelling the Potential Impact of Changing Access Rates to Specialist Treatment for Alcohol Dependence for Local Authorities in England – the Specialist Treatment for Alcohol Model (STreAM)

Alan Brennan PhD, Daniel Hill-McManus BSc, Tony Stone BSc , Penny Buykx PhD, Abdallah Ally PhD, Robert E Pryce PhD, Robert Alston MSc, Andrew Jones PhD, Donal Cairns MSc, Tim Millar PhD, Michael Donmall PhD, Tom Phillips PhD, Petra Meier PhD, Colin Drummond MD.

Corresponding author:
Alan Brennan, a.brennan@sheffield.ac.uk
ScHARR, School of Health and Related Research, University of Sheffield
Regent Ct, 30 Regent St, Sheffield S1 4DA, ENGLAND
Tel:+44 (0)114 2220684 Fax:+44 (0)114 2724095

Authors Affiliations:

University of Sheffield Modelling Team and Public Health Research Team:
Alan Brennan, Daniel Hill-McManus, Tony Stone, Abdallah Ally, Robert E Pryce, Duncan Gillespie, Penny Buykx, Petra Meier
ScHARR, School of Health and Related Research, University of Sheffield
Regent Ct, 30 Regent St, Sheffield S1 4DA, ENGLAND
Tel:+44 (0)114 2220684 Fax:+44 (0)114 2724095

University of Manchester Research and NDTMS Data Analysis Team:
Andrew Jones, Robert Alston, Donal Cairns, Michael Donmall
Division of Population Health, Health Services Research & Primary Care
University of Manchester, Oxford Rd, Manchester, M13 9PL
Tim Millar
Division of Psychology & Mental Health,
University of Manchester, Oxford Rd, Manchester, M13 9PL

Kings College London Clinical and Evidence Review Team:
Colin Drummond, Amy Wolstenholme, Tom Phillips, Catherine Elzerbi
Addictions Department, National Addiction Centre
Institute of Psychiatry, Psychology and Neuroscience
King's College London, 4 Windsor Walk, London SE5 8AF

Funding:
This is independent research commissioned and funded by the Department of Health Policy Research Programme (An Evidence-based Model for Estimating Requirements for Specialist Alcohol Treatment Capacity in England, PR-R4-0512-12002). The views expressed in this publication are those of the authors and not necessarily those of the Department of Health.

Abstract

Objective

Modelling impact of changing specialist treatment access rates to different treatment pathways on future prevalence of alcohol dependence, treatment outcomes, service capacity, costs, and mortality.

Methods

Local Authority numbers and prevalence of people 'potentially in need of assessment for and treatment in specialist services for alcohol dependence' (PINASTFAD) are estimated by mild, moderate, severe and complex needs. The specialist treatment access rate per PINASTFAD person is estimated and from 22 different treatment pathways are classified from administrative data. . Other model inputs include natural remission, relapse after treatment, service costs and mortality rates.

'What-if' analyses assess changes to specialist treatment access rates and treatment pathways. Model outputs include: numbers and prevalence of people who are PINASTFAD , numbers treated by 22 pathways, outcomes (successful completion with abstinence, successfully moderated non-problematic drinking, re-treatment within 6 months, dropout, transfer, custody), mortality rates, capacity requirements (numbers in contact with community services, or staying in residential or inpatient places), total treatment costs and general healthcare savings.

Five scenarios illustrate functionality: A) no change; B) achieve access rates at 70th percentile nationally; C) increase access by +25%; D) increase access to Scotland rate; E) reduce access by -25%

Results

At baseline, 14,581 people are PINASTFAD (2.43% of adults) and the specialist treatment access rate is 10.84%. The 5 year impact of scenarios on PINASTFAD numbers (versus no change) are: B) reduce by 191 (-1.3%); C) reduce by 477 (-3.3%); D) reduce by almost 2800 (-19.2%); and E) increase by 533 (+3.6%). Relative impact is similar for other outputs.

Conclusion

Decision makers can estimate the potential impact of changing specialist treatment access rates for alcohol dependence.

Introduction

Alcohol dependence causes a substantial burden on individuals and wider society, including increased risk of mortality and costs to health services(World Health Organization, 2014). In many countries, assessment and structured treatment pathways exists, and national guidelines such as those by NICE (National institute for health and Care Excellence) in England set out recommendations for different groups of clients(National Institute for Health and Clinical Excellence, 2011). Within published literature, the most complete approach to modelling the system impact of changing access rates to alcohol treatment services was undertaken by Rush(Rush, 1990). This followed four steps: 1) determine the geographic area and population size; 2) estimate the number of problem drinkers and alcohol dependent drinkers (i.e. in-need population); 3) estimate the number of individuals that should be treated in a given year (i.e. demand population); 4) estimate the number of individuals that require service from each component of the treatment system.

Our research was commissioned by the UK Department of Health Policy Research Programme (Brennan et al., 2016). Variations in service provision were known to exist within England and also between UK countries. For example, recent investments in Scotland meant that annual numbers of treatments provided per overall population was approximately 3 times higher than in England (for details of calculation see p241 of (Brennan et al., 2016)). Our research objective was to extend the Rush framework to develop a capacity model - the Specialist Treatment for Alcohol Model (STreAM) version 1.0 – which estimates the numbers of people potentially in need of assessment for and treatment with specialist treatment services for people with alcohol dependence, estimates the numbers of people currently accessing those services, and quantifies the effects of changing specialist treatment access rates in England.

The methods to estimate Local Authority (LA) prevalence of alcohol dependence are reported in detail elsewhere (see chapter 4 of(Brennan et al., 2016)). Our approach extended that of the 2004 ANARP study (Drummond et al., 2005). ANARP focussed on levels of alcohol use, measured using Alcohol Use Disorders Identification Test (AUDIT) score categories(Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). Extending this, we developed statistical models following three steps. Step 1 used the APMS - Adult Psychiatric Morbidity Survey 2007 (McManus, Meltzer, Brugha, Bebbington, & Jenkins, 2009). We developed a regression model of the probability that an individual has AUDIT score in one of 4 bands (AUDIT 0-7, 8-15, 16 to 19, 20+). Covariates were age, gender, Index of Multiple Deprivation (IMD) quintile, and the rate of person specific hospital admissions with a diagnosis code of alcohol dependence (ICD-10 codes F10.2, F10.3, F10.4, F10.5, or F10.6 either as a primary or secondary diagnosis). Step 2 used the APMS to model the probability that the Severity Of Alcohol Dependence Questionnaire (SADQ(Stockwell, Hodgson, Edwards, Taylor, & Rankin, 1979)) is in one of four bands (0-3, 4-15, 16-30, 31+) –with the same covariates as step 1 plus additionally the AUDIT band (0-7, 8-15, 16-19, 20+). We then defined people who are 'potentially in need of assessment and specialist treatment for alcohol dependence' as those with an AUDIT score 20 +, or, those

with a score of AUDIT 16 to 19 and a score of 16+ on SADQ. We also defined three severity subgroups based on SADQ 4-15 (mild), SADQ 16-30 (moderate) and SADQ 31+ (severe), and separated into gender and 4 age groups (18-24, 25-34, 35-54, 55+). Step 3 made a final adjustment for the estimated number of homeless people, using data on people registered as homeless in each local authority(Government Statistical Datasets) and evidence on the proportion of homeless people with alcohol dependence(Gill, Meltzer, Hinds, & Petticrew, 1996). Throughout this paper we use an abbreviation for this population of interest for our modelling – the people who are 'potentially in need of assessment and specialist treatment for alcohol dependence' – PINASTFAD. The PINASTFAD prevalence for a particular geographical area is therefore defined as the estimated number people who are PINASTFAD divided by the adult (18+) population for that geography. We estimated PINASTFAD prevalence for England and for each of the 151 Upper Tier Local Authorities, with results showing 7 fold variation (chapter 4 of (Brennan et al., 2016)).

The National Drug Treatment Monitoring System (NDTMS), which provides data on clients' specialist treatment for alcohol dependence, was then used to define and quantify Specialist Treatment Access Rates (see chapters 5 & 6 of(Brennan et al., 2016)). The NDTMS is a national administrative database which records data on clients' specialist alcohol treatment. 'Treatment journeys' are defined by linking together a client's several structured treatment episodes if they overlap in time or are separated by fewer than 22 days between discharge and next treatment start date. For example, a client might spend some time in an inpatient facility together with community support soon afterwards. We define and use two main Specialist Treatment Access Rates. The denominator in each case is the no. of people who are PINASTFAD. The first rate used in the model is the Starting Specialist Treatment Access Rate, defined with the numerator as the no. of people who have a start date for their treatment journey during the NHS administrative year e.g. between 1st April 2013 and 31st March 2014. If the same person starts two different treatment journeys (e.g. one in April and another separate one later in December), this person is counted only once in this calculation. The second rate used is the Experiencing Specialist Treatment Access Rate, defined with the numerator as the no. of people who experience contact with specialist treatment at any time during 1st April 2013 to 31st March 2014 i.e. including people whose episode started before but ended after 1st April 2013. Again, if a person experiences two different treatment journeys, he or she is counted only once. We separate analyses of Specialist Access Treatment Rates by gender and 4 age groups (18-24, 25-34, 35-54, 55+). We also define three severity subgroups using NDTMS. Unfortunately, NDTMS does not record either AUDIT or SADQ. We defined severity subgroups using the data collected in the NDTMS at the beginning of structured treatment i.e. 'what was the number of units you consumed in a typical drinking day in the previous 28 days?'. We defined 3 severity bands using 0-15 units, 16-30, and 31+ units. The results of these Specialist Treatment Access Rate calculations showed substantial variations, with an 11-fold variation across Local Authorities (reported in chapter 6 of(Brennan et al., 2016)).

This article describes the Specialist Treatment for Alcohol Model (STreAM) version 1.0, which estimates the potential impact of changing Specialist Treatment Access Rates from current levels, either at England or at Local Authority level. We describe the model structure, its inputs and the evidence upon which they are based. We then demonstrate the model's functionality and outputs using an illustrative case study showing the potential impact of five scenarios for changing Specialist Treatment Access Rates in one exemplar Local Authority (Leeds).

Methods

Model Overview

The STreAM model examines, for a particular local authority geographical area, the overall adult population and the dynamics of numbers of people who are 'potentially in need of assessment and specialist treatment for alcohol dependence' – PINASTFAD. For most of the model, simple arithmetic is used. So the numbers of PINASTFAD people in a future period equals the current numbers, plus new people becoming PINASTFAD minus the people who stop being PINASTFAD. This is all calculated by examining the numbers of people receiving specialist treatment, successful treatment completion rates, natural remission without treatment, and relapse rates after earlier successful treatment. The model also has inputs for general population demographics, mortality rates, increased mortality risk for people who have alcohol dependence, and ageing effects including new 18-19 year olds entering the model each year. In addition to the numbers of people, the model also examines resources required to treat clients in different settings (community, residential and inpatient), and the costs of commissioning such services.

Basic Input Data on the Potentially In need Population

The adult population structure for a Local Authority is obtained from national population estimates (https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates Accessed 27th March 2018). The methods to estimate the numbers of people who are 'potentially in need of assessment and specialist treatment for alcohol dependence' – PINASTFAD were summarised in the introduction and are reported in detail elsewhere (chapter 4 of(Brennan et al., 2016)). Table 1 shows the population of just over 600,000 adults and the estimated numbers of people who are PINASTFAD (14,581, so an overall prevalence rate of 2.43%) for our exemplar LA as well as the breakdown by age / gender / severity.

Data on Current Specialist Treatments and Percent Successful Completion Rates

Table 1 also shows the summary baseline NDTMS data for our exemplar LA, with a total of 1580 individuals starting a new treatment journey, meaning that the Starting Specialist Treatment Access Rate i.e. the proportion of the people who are PINASTFAD gaining treatment access was overall 10.84%. This varies substantially by age / gender / severity group. Chapter 5 of (Brennan et al., 2016) and its appendices detail the specification of NDTMS analyses used.

In the model, clients currently treated in the LA are classified into one of 22 different pathways, which are defined using NDTMS data on setting (community, residential, inpatient), type of treatment (psychosocial only, use of withdrawal and or relapse prevention pharmacotherapy) and other factors (detailed definitions are in section 5.3 of (Brennan et al., 2016)**Error! Reference source not found.**. Here, we report results in which these 22 pathways are aggregated into 4 groups: community-based psychosocial treatment only, community-based psychosocial treatment with pharmacotherapy for withdrawal support and/or relapse prevention, residential treatment, and inpatient treatment. Section E of Table 1 shows the proportion of the treatment journeys undertaken within each of these 4 groups and compares our exemplar LA with the national average – showing lower use of psychosocial only pathways, a greater use of community based pharmacological treatment, more residential based and less inpatient based care than the national average.

NDTMS records 6 different treatment outcomes as follows: successful completion of treatment journey with abstinence, successful completion of treatment journey with moderated non-problematic drinking, re-treatment within 6 months, drop out, transfers to other service or taken into custody. Section F of Table 1 shows the treatment outcomes for our exemplar LA versus the national average – showing higher rates of success with moderated non-problematic drinking and lower dropout before treatment completion rates.

Modelling Natural Remission without Specialist Treatment

Table 2 shows the model input parameters affecting the dynamics of prevalence.

Evidence on natural remission comes from the long term US NESARC studies (Table 2 Part A). We differentiate remission to becoming an abstainer (26%) from remission to drinking at moderate levels (74%) (see Table 1 of (Dawson, Li, Chou, & Grant, 2009)). We estimate an overall average remission rate of 9.1% per annum from NESARC (given 1172 clients dependent at baseline, three years later there were 76 in abstinent remission plus 216 in non-abstinent remission). Evidence that remission rates are lower for older ages (Table 4 of (Dawson et al., 2006)) is used to estimate a relative hazard of remission by age group, 1.36 for 18-24, 1.1 for 25-34, 0.85 for 35-54, 0.69 for 55+, and hence our estimated remission rates by age are 12%, 10%, 8% and 6% respectively. We were unable to identify differential remission rates for different severity of dependence groups and have assumed they are equal for mild, moderate, severe and complex needs groups.

Modelling Relapse after Specialist Treatment

Table 2 Part B shows relapse rates for formerly dependent current abstainers and formerly dependent current moderate drinkers. We used a previously published statistical model of NESARC data (see Table 4 of (Dawson, Goldstein, & Grant, 2007)), which predicts recurrence of DSM alcohol dependence conditional on age and current drinking status. From this we derived single year age band probabilities of relapse, and then averaged these into the 4 age groups in our model. We were unable to find relapse evidence by severity of dependence and so assume that the proportion of relapsed people flowing into each dependence severity

group is pro rata to the baseline proportion of people in mild, moderate, severe, and complex needs from our prevalence estimates (i.e. specific to each LA).

There is no directly available data on the number of people in the formerly alcohol dependent state at the start of the model run. We estimate this as follows. We do have (a) the baseline prevalence estimates of alcohol dependence according to AUDIT/ SADQ (**Table 1**), and (b) our literature derived relapse and remission rates (Table 2). We use both of these together to derive the size of the former dependent groups making one further assumption. We assume that the relative size of the dependent and formerly dependent groups can only change via relapse and remission, and that they are in equilibrium. We then calculate the size of the formerly-dependent groups such that when relapse/remission rates are applied, the numbers leaving the dependent group and transitioning to formerly dependent is exactly equal to the numbers entering the dependent group from the formerly dependent group.. This is likely to be a reasonable assumption if prevalence trends are gradual and if we are looking ahead a small number of years.

Modelling New Incidence, Ageing and Mortality each year

To account for new incidence and ageing, as each year is modelled, a new set of 18-19 year olds prevalent with the same rate of alcohol dependence as the subgroup of 18-24 year olds at baseline (Table **1** Part B) is incorporated. Some people also age into the next age group cohort each year e.g. 1 /10^{th} of the people in the 25-34 age subgroup transfer to the 35-54 subgroup every year.

Mortality rates for the general population in each age/gender group are calculated using 2012 ONS Death Registrations (Statistics, 2013) and population estimates. To adjust mortality for current alcohol dependence we use German evidence that annualized death rates given dependence are 4.6-fold higher for women and 1.9-fold higher for men (John et al., 2013). To estimate mortality in formerly alcohol dependent people, we use a meta-analysis showing an odds ratio for mortality of 0.35 for abstainers compared to continued heavy drinking in alcohol use disorders (Figure 2 of (Roerecke, Gual, & Rehm, 2013)), and an odds ratio for mortality of 0.61 for those still drinking but with reduced alcohol consumption and abstainers excluded (Figure 3 of (Roerecke et al., 2013)).

Method to Calculate Next Year PINASTFAD Prevalence using Modifiable Model Parameters

Integrating the parameters described above, we model the dynamics of future prevalence with a simple arithmetic process. Prevalence of dependence in the next period is basically the prevalence now, minus those who achieve stable abstinence/moderated non-problematic drinking following treatment, minus also the proportion of people who achieve natural remission, plus the number of people who relapse from their state of former dependence, minus the number in the cohort who died. This is done for 8 age/gender subgroups, with an adjustment in the youngest age band to account for new 18-19 year olds each year.

Three main modifiable parameters are used to develop what-if scenarios. The first is the Starting Specialist Treatment Access Rate which could be increased or decreased by the user. Calculations are done on a weekly basis (52 weeks equals one year). The number of people entering treatment each week is calculated from the user input annual Starting Specialist Treatment Access Rate divided by 52 (the default being the 2013/14 baseline Starting Specialist Treatment Access Rate for the LA modelled). The second set of modifiable parameters are the proportions of people assigned to the 22 different pathways (default being calculated based on 2013/14 assignments for the LA modelled). The third modifiable parameters concern the proportions achieving different outcomes (successful completion of treatment journey with abstinence, dropout etc.), with the default being the national average outcome percentages for each pathway.

Modelling Impact on Future System Capacity required using duration of treatment journeys data

Our study also examined the capacity requirements within the system in terms of numbers of people in contact with community based services at any one time and numbers of residential and inpatient places required at any one time. To convert estimates of the numbers of people starting treatment each week into numbers of people in contact at any one time, the model uses information on national average duration of treatment by 3 severity subgroups (using 'number of units consumed in typical drinking day in previous 28 days'), by the 22 pathways and by the 6 different treatment outcomes. As an example, people with 0-15 units per typical drinking day at baseline, who access pathway number 1 'community psychosocial only treatment', and achieve an outcome of 'successful completion of treatment journey with moderated non-problematic drinking', have an average treatment journey duration calculated from NDTMS of 19 weeks. So, within the model, if say people experiencing this path enter community psychosocial only treatment in week 20 of the financial year, then we model them as leaving the treatment system in week 39. At that point these people enter the 'former dependent with current moderate non-problematic drinking' state within the model. A second more complicated example is people with more than 30 units per typical drinking day at baseline, who access pathway number 11 in the model, i.e. 'Inpatient assisted withdrawal followed by community psychosocial and pharmacological relapse prevention', and achieve an outcome of 'successful completion of treatment journey with abstinence'. Analysis of NDTMS shows their average treatment journey duration to be 26 weeks community based treatment plus 2 weeks inpatient treatment. So, if such people enter treatment in week 20 of the model, they will leave the system and enter the 'former dependent and abstaining drinking' state within the model in week 48.

The model undertakes calculations like the examples above each week of the financial year for all 3 severity subgroups (0-15, 16-30 and 31+ units), all 22 pathways, and all 6 outcome combinations for each week. Summing these calculations up, the model then provides three key output measures of required capacity:- numbers of community based clients required to be treated weekly, numbers of residential places required, and numbers of inpatient places required.

Unit Costs Data for Components of Specialist Treatment and General NHS Care

Finally, our study examined costs. There is no national dataset for commissioning costs of specialist treatment for alcohol dependence. Instead, we updated recent estimates of costs from the NICE CG115 guidelines (National Institute for Health and Clinical Excellence, 2011), to quantify costs per week for each component (see Table 3 and Appendix 8.3 on p249 of (Brennan et al., 2016) for full methods). Within the model calculations, these weekly costs are multiplied by national average durations observed in the NDTMS for each severity-pathway-outcome combination. A user can overwrite default cost inputs and durations if more accurate local costings are available.

We also examine a broad estimate of the cost impact of changes in prevalence of alcohol dependence over time on general NHS care. We use an annual estimate of additional general NHS care for a person dependent on alcohol of £1,800 per person based on NICE guidelines (National Institute for Health and Clinical Excellence, 2011), and assume that this will reduce to zero when people move from alcohol dependence a state of former alcohol dependence. Discounting of future costs is undertaken at 3.5% per annum and the model time horizon in these analyses is 5 years.

Approach to What-If Analysis

The model has been constructed in Microsoft EXCEL with VBa macros. To examine the impact of scenarios, the STreAM model allows the user to make two main changes to model inputs. The user can alter Specialist Treatment Access Rates from their current levels. This can be done at the whole population level or for specific age / gender subgroups. The user can also alter the percentages of people assigned to each of the 22 different pathways. The research team is able to adapt and develop the model and undertake more 'under the hood' changes to any of the input variables.

When running a scenario analysis, the model is usually run so that it compares the proposed new Specialist Treatment Access Rates with 'same as last year's Specialist Treatment Access Rates and percentage assignment to pathways'.

The model outputs analyse the difference between the two scenarios modelled. These include the differences in the following outputs: numbers of people who are PINASTFAD, numbers of people successfully treated, numbers of deaths, specialist treatment costs, general NHS costs, and three required capacity outputs - number of people in contact with community services at any one time, numbers of residential places and numbers of inpatient places.

Illustrative Exemplar Case Study

The exemplar analyses in this paper are for the city of Leeds LA. It is important to emphasise that the scenarios examined are entirely illustrative and have not been discussed with local authority commissioners

or service providers in that area. We examine four illustrative scenarios for changing Specialist Treatment Access Rates, each compared against a base senario of keeping rates at the same level as 2013/14:

A. No change
B. Set Specialist Treatment Access Rate for each age/gender subgroup to be at the 70th percentile level nationally (i.e. only 30% of LAs have a higher Specialist Treatment Access Rate for that age/gender subgroup)
C. Increase Specialist Treatment Access Rate by a factor of +25%
D. Increase access rates to approximately the levels currently achieved in Scotland
E. Reduce Specialist Treatment Access Rate, by a factor of -25%

Results

Detailed Analysis for Scenario B (achieve 70th percentile access rates) versus Scenario A (No Change in access rates)

Table 4-1 shows the input Specialist Treatment Access Rates for scenario B, the 70th percentile nationally for each age/gender group compared to the most recent year alongside those for scenario A. Scenario B implies a slightly higher number of new journeys overall - 1713 versus 1580, an extra 133 people per annum starting treatment (+8.4%), which would move this Local Authority from being ranked 64th (of 151) up to being ranked 50th for its Specialist Treatment Access Rates. The input Specialist Treatment Access Rates vary by age/gender for this scenario and the increases in access are highest for 18-24 males, 18-24 females, and males 55+, with small decreases in access implied for 35-44 year old males and females.

Table 4-2 shows that the impact of this on the numbers of people who are PINASTFAD. By the end of 5 years this is estimated to be 191 lower for scenario B than it would be under scenario A. This is a small difference, approximately a 1.3% reduction of the baseline 14,851 numbers of people who are PINASTFAD. The implied prevalence of PINASTFAD per total adult population in 5 years' time would be marginally lower at 2.23% under scenario B versus 2.26% under scenario A. Most of the estimated lower numbers occurred in the mild dependence (-102) and moderate dependence (-72) subgroups.

Table 4-3 shows a summary of the outcomes for people receiving specialist treatment. In total over 5 years, an additional 449 people are estimated to exit treatment under scenario B compared to scenario A. This includes 282 additional successful treatments, of which 171 are successful completion of treatment journey with abstinence, and 111 successful completion of treatment journey with moderated non-problematic drinking. There is also a small estimated impact on mortality, with 8 fewer deaths over 5 years, all of which are in the male 55+ subgroup (not shown in Table).

Figure 1A shows that the overall prevalence of people who are PINASTFAD is estimated to be falling under scenario A, and falling marginally more under scenario B. Figure 1B shows that the difference in prevalence

between scenario B and scenario A is larger for males 55+ than for females 55+. This reflects the inputs for Scenario B in that Specialist Treatment Access Rates were increased more for males 55+ than females 55+ and it also explains why the modelled reductions in mortality are estimated to be occurring mostly in males 55+.

Table 4-4 shows the implied difference in impact on capacity required. At year 5, we estimate the additional number of people receiving community based services care at any one time under is 31 more for scenario B than for scenario A. Tables in the Supplemental Online Appendix show that, in year 5, the number of people receiving community based services care at any one time under scenario B is 488. The additional capacity for residential based care is around 1 extra place on a typical day under scenario B compared to scenario A (13.3 versus 12.4 residential places). Very little additional capacity would be required in the inpatient service (0.5 inpatient places under both scenario B and A).

Table 5 shows the differences between scenario B and scenario A for the estimated number of former dependent drinkers in the population. By the end of year 5, this shows an additional 199 people are in the former dependent group, with 145 of these abstaining. Most of the differences are in the males aged 18-24 (46 of them), aged 25-24 (68 of them) and 55+ (63 of them).

Finally, our broad analysis of financial cost impact estimates that the extra (discounted) cost of providing the additional specialist treatment services in scenario B compared to scenario A is around £2¼m cumulatively over 5 years. This would be somewhat offset by general NHS cost savings of approximately £1m due to lower numbers of people with alcohol dependence.

Comparison f Results across scenarios A to E

Figure 2 compares scenarios B, C, D and E all against the no change scenario A. A detailed results table for each scenario is given in the Supplemental Online Appendix.

Figure 2-1 shows the estimated impact on the numbers of people who are PINASTFAD in 5 years' time, with scenario B achieving a reduction of 191, C (a 25% increase in Specialist Treatment Access Rates) a reduction of 477, whilst D (increasing to approximately Scottish rates) results in a reduction of almost 2800. Scenario E (a reduction i.e. -25% change in Specialist Treatment Access Rates) would cause an estimated increase in numbers of people potentially in need of treatment for alcohol dependence of +533. This relative scale of impact is reflected in the other model outputs. Mortality averted over five years is almost 10 times higher for scenario D (73 fewer deaths) than scenario B (8 fewer), whilst scenario E is estimated to result in an increase in mortality (+15 deaths).

In terms of capacity, comparing scenario D versus A, the additional number of people receiving community based services care at any one time is estimated to be around 370 (a substantial larger difference than that of 31 people for scenario B versus A). Similarly, the additional capacity for residential and inpatient based

care (combined) is around 11 extra places on a typical day under scenario D (which would be almost double the current baseline level of 12.9 people in residential or inpatient care). Scenario E would imply a change (reduction) in capacity requirements of around minus 84 community places and minus 2 inpatient / residential places.

Finally, the broad cost analyses show a similar pattern. The cumulative additional cost of specialist treatment over 5 years is almost +£29m for scenario D versus A as compared to £2.1m for scenario B versus A, and scenario E would show a saving in specialist treatment costs of around -£5.5m. The indicative estimated NHS costs averted due to reduced prevalence of alcohol dependence would also be substantially larger under scenario D (around -£16m for D versus A, compared to -£1m for B versus A) and there would be a rise in general NHS costs under scenario E of an estimated +£2.8m.

Discussion

This study develops a new Specialist Treatment for Alcohol Model (STreAM) framework to examine the impact of changing Specialist Treatment Access Rates and treatment pathway assignment for people who are potentially in need of assessment and specialist treatment for alcohol dependence. The study incorporates evidence from English national surveys and sources of routine data wherever possible, particularly using the Adult Psychiatric Morbidity Survey and the National Drug Treatment Monitoring System, and combines this with published evidence on natural remission and relapse after treatment. The new model extends the Rush et al.(Rush, 1990) framework and allows Local Authorities to consider commissioning decisions and their potential impact on outcomes. The outcomes examined are:- future prevalence of alcohol dependence, service capacity required, mortality, commissioning costs for structured treatment, and NHS costs averted if future alcohol dependence prevalence can be reduced.

There is an important issue to consider when interpreting results. It is acknowledged that the model default rates for relapse and natural remission are based on literature estimates from long term US studies because neither national nor local authority level UK data are available on these parameters. One implication of this is that the model outputs for the no change scenario do not produce a steady state 'flat line' for LA prevalence. In a sense the model is not a really a prediction of what will happen in our local LA under no change, because we cannot be sure whether the natural remission and post treatment relapse rates used from US studies are reflective of this particular LA in England at this time. It is instructive to think of model outputs in terms of what-if scenarios i.e. "what if under scenario A there is no change in Specialist Treatment Access Rates and the US remission and relapse rates were to apply to this LA?", as compared with "what if under scenario B the Specialist Treatment Access Rates were at the 70th percentile nationally and the US remission and relapse rates were to apply to this LA?" A second implication is that, as researchers, we feel more confident about the results in terms of differences between the scenarios (e.g. Scenario B minus

Scenario A giving 191 fewer people who are PINASTFAD in 5 years' time), than we do about the absolute levels of scenario A or scenario B results in the model.

There are some limitations to evidence and our analysis. The modelling of health benefits is relatively simple in that it uses population average death rates by age and gender combined with a relative risk of mortality for two subgroups - people are in the alcohol dependent state and people who are in the formerly alcohol dependent state. It would be possible in principle, though a substantial research task, to link together this work with that of the Sheffield Alcohol Policy model (Brennan et al. 2015) which takes a wider public health perspective of the whole population and models 43 different health conditions Secondly, our modelling does not include some important impacts such as reductions in crime, the reductions in harm to others including children or partners of people who are alcohol dependent, and reductions in social care costs for children or and adults. Finally, our present analysis does not undertake a cost per quality adjusted life years gained analysis because we have not modelled the disease profile or health related quality of life losses for people with alcohol dependence.

Several research priorities for have emerged as important through consideration of the evidence gaps. Firstly, since the APMS is only undertaken every 7 years. The estimation of prevalence of people who are PINASTFAD can become somewhat out of date. At present the model simply starts with the latest year's estimated prevalence, rather than utilising trend evidence. More frequent collection of estimates of alcohol dependence prevalence would be useful. Secondly, the NDTMS does not collect any information routinely on the severity of alcohol dependence, other than the number of units drunk on a typical drinking day in the last month. We would strongly advise incorporation of the AUDIT and the SADQ into NDTMS, so that benchmarking across local authorities in relation to the Specialist Treatment Access rates for severity subgroups can be undertaken. Third, despite there being considerable evidence for the effectiveness of specialist treatments for alcohol dependence, it is less clear what the wider natural history of alcohol dependence looks like in England. For the modelling of relapse rates after specialist treatment, and the natural remission of people who are untreated, we have had to rely on published literature estimates from the long term U.S. studies. It would be useful if research were undertaken in England to attempt to quantify both natural remission and relapse rates.

Finally, we have considered the generalisability of this modelling framework to other countries. This would be possible if the datasets on prevalence of alcohol dependence and access to Specialist Treatment in a particular country are very similar to those in England. We would advise that the international research community consider making recommendations globally on a standardised framework for estimating prevalence of people in need of assessment and specialist treatment for alcohol dependence. We would further advise making recommendations to produce standardised definition of Specialist Treatment Access Rates which could also prove powerful for international benchmarking.

In conclusion, this new STreAM model provides a framework and quantitative methodology for analysing the potential impact of increasing access to specialist treatment for alcohol dependence in England and we hope it will be useful to policy makers in England and adaptable globally.

Tables and Figures

Table 1 Summary of key model inputs for one Exemplar Local Authority

	All	Male				Female				
		18-24	25-34	35-54	55+	18-24	25-34	35-54	55+	
A: Population age 18 +										
	600,830	49,070	56,789	97,948		87,621	51,295	56,882	98,356	102
B: Estimated numbers of people who are potentially in need of assessment and specialist treatment for alcohol dependence ('**PINASTFAD'**)										
Total	14581	3533	3982	3052	1121	1555	443	700	197	
Mild[a]	7572	1591	1904	1664	738	805	284	444	142	
Moderate[b]	5626	1540	1671	1152	314	607	117	200	25	
Severe[c]	1145	372	377	206	39	113	12	26	0	
Severe & Complex[c]	238	30	30	30	30	30	30	30	30	
C: Number individuals starting a new treatment journey 2013/14 (NDTMS)										
Total	1580	48	214	612	139	36	126	302	103	
0-15 units/week[e]	550	17	76	144	39	16	50	135	73	
16-30 units/week[f]	426	16	61	185	50	8	18	73	15	
31+ units/week[g]	208	5	26	108	23	0	21	20	5	
Complex needs[h]	396	10	51	175	27	12	37	74	10	
D: Starting Specialist Treatment Access Rate (no. of new journeys divided by no. of people who are PINASTFAD) - %										
Total	10.84	1.36	5.37	20.05	12.40	2.32	28.46	43.16	52.37	
Mild (e/a)	7.26	1.07	3.99	8.65	5.28	1.99	17.61	30.41	51.41	
Moderate & Severe (f+g)/(b+c)	9.36	1.10	4.25	21.58	20.68	1.11	30.23	41.15	80.00	
Moderate & Severe + complex (f+g+h)/(b+c+d)	14.70	1.60	6.64	33.73	26.13	2.67	47.89	65.31	54.85	

E: Completed journeys according to pathway (4 broad categories) - %

	Community Psychosocial	Community Pharmacology	Residential	In-patient	Total
Exemplar Local Auth	43	49	7	1	100
National	77	14	2	7	100
Difference	-34	35	5	-6	

F: Completed journeys according to outcome - %

	All success	Success (abstain)	Success (non-problematic drinking	Dropout	Transfer	Died	Total
Exemplar Local Auth	61	35	26	32	6	1	100
National	47	33	14	45	6	1	100
Difference	14	2	12	-13	0	0	

Table 2 Model parameters affecting the dynamics of prevalence over time

Table 2 PART A: Natural Remission Parameters Derived from NESARC Study							
Gender	Age Band	**Prob. entering subgroup given remission**		**Annual natural remission rates (without treatment)**			
		Former AD Abstainer	*Former AD Drinker*	*Mild AD*	*Moderate AD*	*Severe AD*	*Complex Needs*
Male	18 to 24	26%	74%	12%	12%	12%	12%
	25 to 34	26%	74%	10%	10%	10%	10%
	35 to 54	26%	74%	8%	8%	8%	8%
	55 +	26%	74%	6%	6%	6%	6%
Female	18 to 24	26%	74%	12%	12%	12%	12%
	25 to 34	26%	74%	10%	10%	10%	10%
	35 to 54	26%	74%	8%	8%	8%	8%
	55 +	26%	74%	6%	6%	6%	6%
Table 2 PART B: Relapse parameters							
Gender	Age Band	**Annual relapse rate to alcohol dependence from former dependence**		**Probability of entering each subgroup given relapse (Assumed the same %'s as baseline prevalence for the example Local Authority)**			
		Former AD Abstainer	*Former AD Drinker*	*Mild AD*	*Moderate AD*	*Severe AD*	*Complex Needs*
Male	18 to 24	3.4%	12.2%	45.0%	43.6%	10.5%	0.8%
	25 to 34	2.8%	10.2%	47.8%	42.0%	9.5%	0.7%
	35 to 54	1.9%	7.4%	54.5%	37.7%	6.8%	1.0%
	55 +	1.0%	4.5%	65.9%	28.0%	3.5%	2.6%
Female	18 to 24	3.4%	12.2%	51.8%	39.0%	7.3%	1.9%
	25 to 34	2.8%	10.2%	64.2%	26.4%	2.7%	6.7%
	35 to 54	1.9%	7.4%	63.5%	28.6%	3.7%	4.2%
	55 +	1.0%	4.5%	72.2%	12.7%	0.0%	15.1%
Table 2 PART C: Mortality Rates Per 1000 Population per Annum parameters							
Gender	Age Band	*Never Alcohol Dependent*	*Former AD Abstainer*	*Former AD Drinker*	*Currently Alcohol Dependent*		
Male	18-24	0.00048	0.00047	0.00083	0.00135		
	25-34	0.00066	0.00066	0.00116	0.00190		
	35-54	0.00220	0.00228	0.00397	0.00650		
	55+	0.02897	0.03262	0.05551	0.08789		
Female	18-24	0.00019	0.00047	0.00082	0.00134		
	25-34	0.00034	0.00083	0.00144	0.00235		
	35-54	0.00144	0.00361	0.00627	0.01024		
	55+	0.02838	0.08109	0.13330	0.20137		

Table 3 Costs inputs for the specialist treatment intervention components

Intervention Component	Research team's estimated 2013/14 update to NICE CG115 costings (£)	Duration of component as costed in NICE CG115 (weeks)	Implied Weekly Cost (£)	Implied Daily Cost (£)
Community Psychosocial	99.00	1.00	99.00	£14.14
Pharmacological interventions for relapse prevention	505.00	52.00	9.71	£1.38
Community Assisted Withdrawal	363.00	1.43	254.10	£36.40
Intensive Community Programme	2442.00	3.00	814.00	£116.29
Residential Assisted Withdrawal	5975.00	2.50	2390.00	£341.43
Residential Rehabilitation	633.00	1.00	633.00	£90.43
Comprehensive assessment	454.00	1.00	454.00	£454

Table 4 Impact of Scenario B - achieving 70th percentile of access rates nationally

Part 4-1: Change in no. of journeys under scenario B: achieve 70th percentile of access rates nationally

		Original Starting Specialist Treatment Access Rate	70th %ile Starting Specialist Treatment Access Rate	No of people PINASTFAD By Age / Gender at baseline	Original New Journey Numbers per annum	Implied New Journeys if 70th %ile Numbers per annum
Male	18-24	1.4%	2.3%	3533	48	80
Male	25-34	5.4%	6.3%	3982	214	251
Male	35-54	20.1%	19.1%	3052	612	582
Male	55+	12.4%	16.3%	1121	139	183
Female	1824	2.3%	3.5%	1555	36	54
Female	18-24	28.5%	28.2%	443	126	125
Female	25-34	43.2%	47.8%	700	302	334
Female	35-54	52.4%	52.3%	197	103	103
Total				14581	1580	1713
Overall Implied Specialist Treatment Access Rate					10.8%	11.7%
Overall Rank out of 151 Local Authorities in England (1 = highest)					64	50
Overall Implied percentile					58th	67th

Part 4-2: Impact of scenario B on estimated prevalence of dependence by severity subgroup

Year on year comparison of Scenario B (achieve 70th percentile Specialist Treatment Access Rates) with Scenario A (no change in Specialist treatment Access Rates)

No. of people who are PINASTFAD scenario B minus No. of people who are PINASTFAD scenario A

	Alcohol Dependence subgroups				
Time point	Mild	Moderate	Severe	Complex Needs	Total
Now	0	0	0	0	0
After 1 year	-23	-15	-3	-1	-42
After 2 years	-51	-34	-7	-2	-95
After 3 years	-73	-49	-10	-2	-135
After 4 years	-89	-62	-12	-3	-166
After 5 years	-102	-72	-14	-3	-191

Part 4-3: Impact of scenario B on number of treatment exits by outcome

Year on year comparison of Scenario B with Scenario A (treatment exits scenario B - treatment exits scenario A)

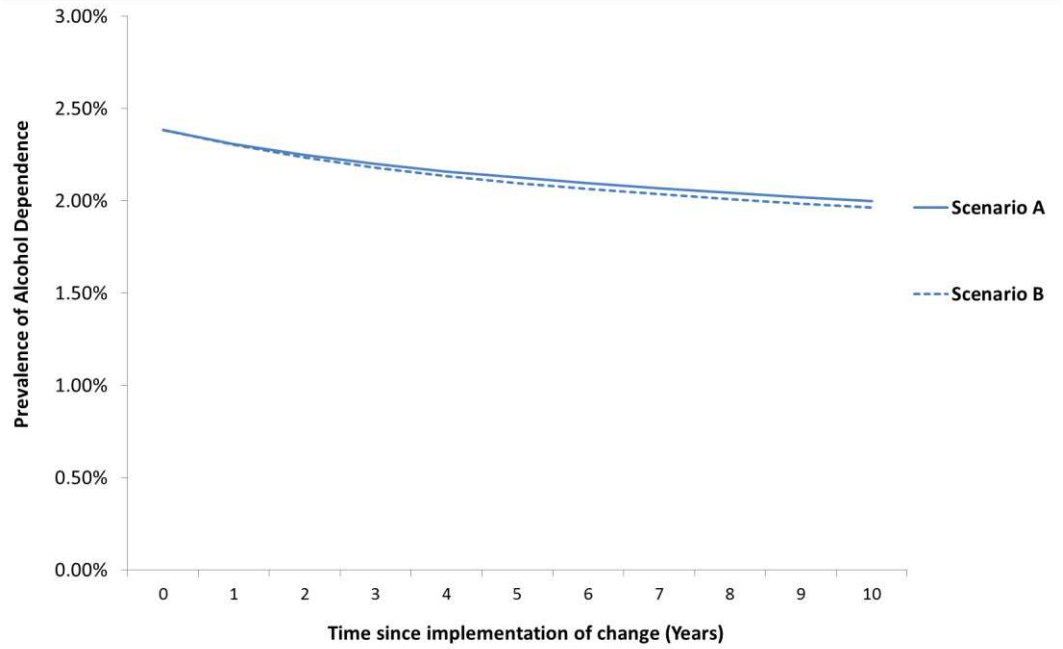
Additional Number of treatment exits by outcome

	Successfully Completed Treatment (Non problem-atic drinking)	Successfully Completed Treatment (Abstinence)	Transferred	Dropped out	Total
Now	0	0	0	0	0
After 1 year	17	27	4	23	70
After 2 years	42	66	9	55	173
After 3 years	66	103	15	86	269
After 4 years	89	138	20	115	361
After 5 years	111	172	24	143	450

Part 4-4: Change in service capacity requirements on a typical day after five years due to scenario B

Community Increase	Residential Increase	Inpatient Increase
30.9	0.9	0.0

Figure 1 Example Trends in Modelled Prevalence for Scenario 1 – 70th percentile in each age group versus no change in access rates



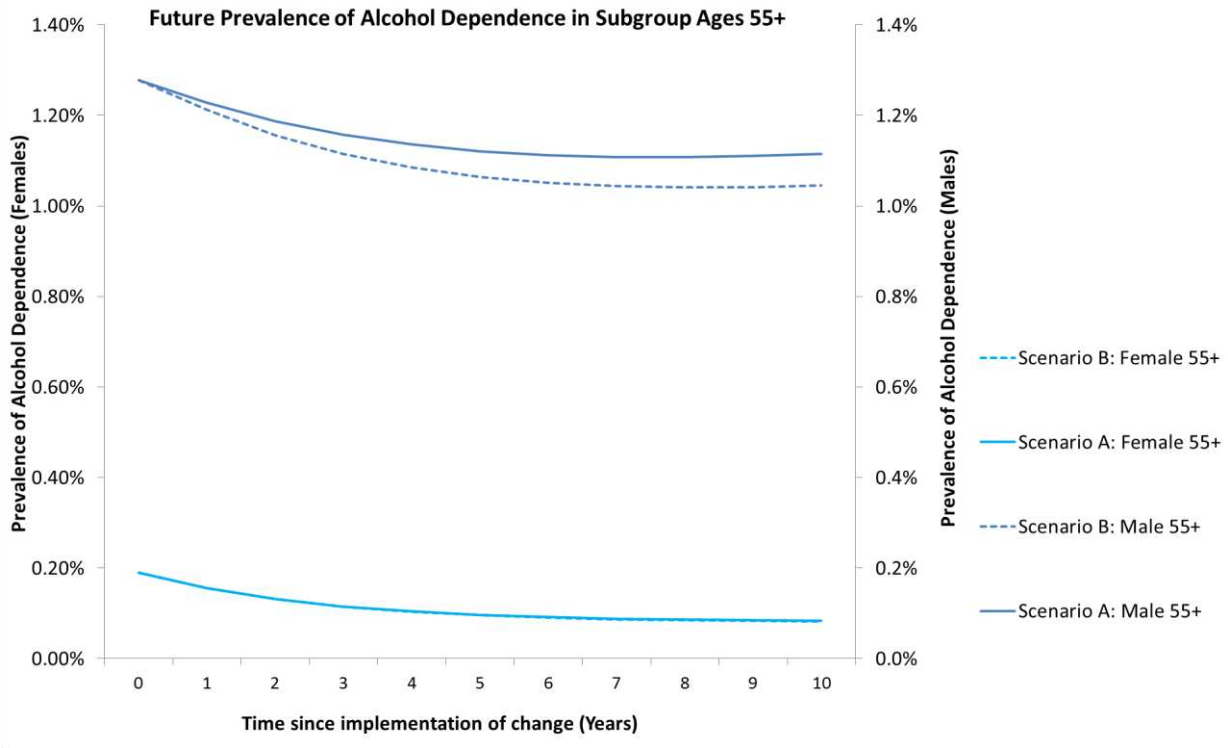
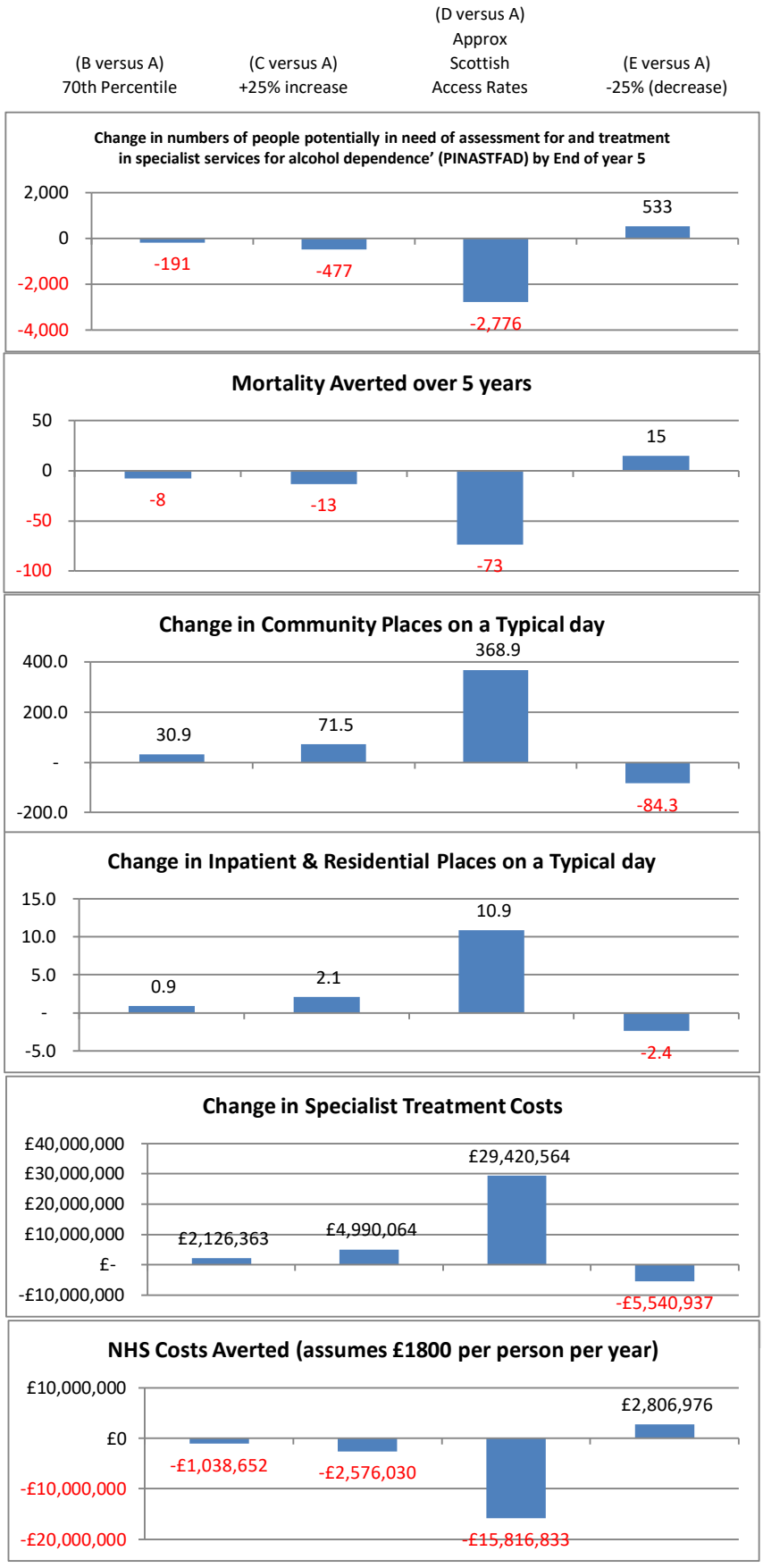


Table 5: Detailed age-sex breakdown of the difference between B (achieving 70th percentile of access rates nationally), and A (no change in access rates).

LEEDS	Baseline	Year 1	Year 2	Year 3	Year 4	Year 5
Number of people in formerly dependent on alcohol states	**0**	**43**	**96**	**138**	**171**	**199**
Abstainers/Alcohol Free	0	27	63	93	121	145
Non problematic drinker	0	16	33	44	51	54
Male 18-24	0	11	25	34	41	46
Male 25-34	0	13	31	45	58	68
Male 35-54	0	-8	-16	-21	-24	-26
Male 55+	0	14	31	44	54	63
Female 18-24	0	6	14	19	23	25
Female 25-34	0	0	1	2	3	4
Female 35-54	0	6	11	14	16	18
Female 55+	0	0	0	1	1	1
	0	**-42**	**-95**	**-135**	**-166**	**-191**
% prevalence per adult population	0.00%	-0.01%	-0.02%	-0.02%	-0.03%	-0.03%
Numbers estimated In Treatment at 1 April	2	34	28	23	19	16
Not in Treatment	-2	-77	-122	-157	-185	-207
Male 18-24	0	-11	-25	-34	-41	-45
Male 25-34	0	-13	-31	-45	-58	-68
Male 35-54	0	8	16	21	24	26
Male 55+	0	-13	-29	-41	-50	-56
Female 18-24	0	-6	-14	-19	-23	-25
Female 25-34	0	-0	-1	-2	-3	-4
Female 35-54	0	-6	-11	-14	-16	-18
Female 55+	0	-0	-0	-1	-1	-1
LEEDS	**Baseline**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Number of people who are PINASTFAD by severity group						
Mild	0	-23	-52	-73	-89	-102
Moderate	0	-15	-35	-50	-62	-72
Severe	0	-3	-7	-10	-12	-14
Complex	0	-1	-2	-2	-3	-3
Numbers of Complete Treatment Journeys	0	**73**	**102**	**96**	**92**	**89**

	Specialist treatment access rate	0	**0.53%**	**0.77%**	**0.75%**	**0.74%**	**0.74%**
	Successful completed	0	45	65	60	58	56
	Not Successfully completed	0	28	38	36	34	33
	Male 18-24	0	21	31	31	30	30
	Male 25-34	0	22	33	32	32	31
	Male 35-54	0	-14	-20	-19	-19	-19
	Male 55+	0	23	32	30	28	27
	Female 18-24	0	12	17	17	17	17
	Female 25-34	0	0	-1	-2	-2	-3
	Female 35-54	0	10	11	8	7	6
	Female 55+	0	0	0	0	0	-1
Number of People in Contact with Service on a Typical Day							
	Community	2.1	37.1	34.5	32.8	31.6	30.9
	Residential	0.1	1.0	1.0	0.9	0.9	0.9
	Inpatient	0.0	0.0	0.0	0.0	0.0	0.0

Figure 2 Comparison of the Impact of Four Different Scenarios for Changing Specialist Treatment Access Rates (versus Scenario A - No change)



Acknowledgements: We are grateful for the valuable contribution of our project stakeholder group, including service providers, service users, academics, commissioners and representatives from DH and Public Health England (PHE). We would particularly like to acknowledge the contribution of those local authorities involved in pilot testing the model. We also thank the Public Health England North West Knowledge Intelligence Team (PHE NW KIT) for their assistance in the provision of Hospital Episode Statistics data, especially Mr Sacha Wyke.

Supplemental Online Appendix – Detailed Model Results

Table 6 Model Results for Exemplar LA - Scenario A - No Change in Access Rates

LEEDS		Baseline	Year 1	Year 2	Year 3	Year 4	Year 5
	offsetting ->->->->->->->->->->	5	57	109	161	213	265
Population		**601106**	**615,444**	**629,781**	**644,119**	**658,457**	**672,795**
Former Dependents		**26,368**	**28,075**	**29,682**	**31,216**	**32,693**	**34,123**
	Abstainers/Alcohol Free	15,081	16,096	17,078	18,039	18,985	19,918
	Moderate Drinker	11,286	11,979	12,603	13,176	13,708	14,205
	Male 18-24	5957	5979	5993	6003	6010	6014
	Male 25-34	6650	6933	7175	7385	7567	7726
	Male 35-54	5690	6331	6936	7513	8064	8592
	Male 55+	2892	3137	3395	3665	3946	4237
	Female 18-24	2622	2639	2651	2659	2665	2669
	Female 25-34	746	1084	1402	1697	1970	2220
	Female 35-54	1304	1420	1539	1669	1812	1969
	Female 55+	508	552	590	624	659	696
Prevalence		**14,576**	**14,430**	**14,374**	**14,379**	**14,427**	**14,505**
	% prev	2.42%	2.34%	2.28%	2.23%	2.19%	2.16%
	Estimated In Treatment at 1 April	1,845	1,649	1,486	1,344	1,218	1,107
	Not in Treatment	12,731	12,781	12,888	13,035	13,209	13,398
	Male 18-24	3,532	3,503	3,481	3,466	3,454	3,445
	Male 25-34	3,981	3,964	3,960	3,965	3,976	3,992
	Male 35-54	3,050	2,996	2,973	2,970	2,983	3,007
	Male 55+	1,120	1,103	1,093	1,091	1,095	1,104
	Female 18-24	1,554	1,534	1,519	1,508	1,500	1,495
	Female 25-34	445	559	650	723	783	833
	Female 35-54	697	609	559	533	522	520
	Female 55+	196	162	140	125	115	108
	Mild	7,568	7,398	7,299	7,248	7,233	7,243
	Moderate	5,626	5,644	5,677	5,719	5,767	5,818
	Severe	1,145	1,166	1,186	1,205	1,222	1,238
	Complex	237	221	212	207	205	205
Treatment Journeys			**1,181**	**1,177**	**1,198**	**1,229**	**1,266**
	% access rate		**8.18%**	**8.19%**	**8.33%**	**8.52%**	**8.73%**
	Successful		745	742	754	773	797
	Not Successful		436	436	444	455	469
	Male 18-24		47	47	47	47	47
	Male 25-34		199	200	202	204	206
	Male 35-54		470	470	477	488	501
	Male 55+		117	114	113	112	113
	Female 18-24		35	35	34	34	34
	Female 25-34		95	126	154	177	197
	Female 35-54		167	145	136	135	138
	Female 55+		50	40	34	31	29
Number of People in Contact with Service on a Typical Day							
	Community	425	415	421	430	443	457
	Residential	11.0	11.0	11.3	11.6	12.0	12.5
	Inpatient	0.4	0.4	0.4	0.4	0.4	0.4

Table 7 Model Results for Exemplar LA - Scenario B – Achieve 70th Percentile Access Rates Nationally for each Age/Gender Band

LEEDS		Baseline	Year 1	Year 2	Year 3	Year 4	Year 5
	offsetting ->->->->->->->->->->	5	57	109	161	213	265
Population		**601106**	**615,444**	**629,781**	**644,119**	**658,457**	**672,795**
Former Dependents		**26,368**	**28,117**	**29,777**	**31,353**	**32,864**	**34,322**
	Abstainers/Alcohol Free	15,081	16,123	17,141	18,133	19,105	20,063
	Moderate Drinker	11,286	11,995	12,637	13,221	13,759	14,259
	Male 18-24	5957	5990	6018	6037	6050	6060
	Male 25-34	6650	6946	7206	7430	7625	7794
	Male 35-54	5690	6323	6920	7492	8040	8566
	Male 55+	2892	3151	3426	3709	4000	4300
	Female 18-24	2622	2645	2665	2678	2687	2694
	Female 25-34	746	1084	1402	1699	1973	2224
	Female 35-54	1304	1426	1550	1683	1828	1986
	Female 55+	508	552	590	625	660	697
Prevalence		**14,576**	**14,387**	**14,280**	**14,245**	**14,261**	**14,314**
	% prev	2.42%	2.34%	2.27%	2.21%	2.17%	2.13%
	Estimated In Treatment at 1 April	1,847	1,683	1,514	1,367	1,237	1,123
	Not in Treatment	12,729	12,704	12,766	12,878	13,023	13,191
	Male 18-24	3,532	3,491	3,457	3,432	3,413	3,399
	Male 25-34	3,981	3,951	3,929	3,919	3,919	3,924
	Male 35-54	3,050	3,004	2,989	2,991	3,007	3,033
	Male 55+	1,120	1,089	1,064	1,050	1,045	1,048
	Female 18-24	1,554	1,527	1,505	1,489	1,478	1,469
	Female 25-34	445	559	649	721	780	829
	Female 35-54	697	603	548	518	505	503
	Female 55+	196	162	140	124	114	107
	Mild	7,568	7,375	7,247	7,175	7,143	7,141
	Moderate	5,626	5,629	5,643	5,670	5,705	5,746
	Severe	1,145	1,163	1,179	1,195	1,210	1,224
	Complex	237	221	211	205	202	202
Treatment Journeys			**1,253**	**1,280**	**1,294**	**1,321**	**1,355**
	% access rate		**8.71%**	**8.96%**	**9.09%**	**9.26%**	**9.47%**
	Successful		790	806	815	831	853
	Not Successful		464	474	479	490	502
	Male 18-24		68	78	77	77	77
	Male 25-34		222	233	234	236	238
	Male 35-54		456	450	458	469	481
	Male 55+		140	146	142	140	140
	Female 18-24		46	52	52	51	51
	Female 25-34		94	125	152	175	194
	Female 35-54		177	156	144	142	145
	Female 55+		50	40	34	31	29
Number of People in Contact with Service on a Typical Day							
	Community	427	452	455	463	474	488
	Residential	11.1	12.0	12.2	12.5	12.9	13.3
	Inpatient	0.4	0.4	0.4	0.4	0.4	0.5

Table 8 Model Results for Exemplar LA - Scenario C – 25% Increase in each age gender group

LEEDS	Baseline	Year 1	Year 2	Year 3	Year 4	Year 5
offsetting ->->->->->->->->->->	5	57	109	161	213	265
Population	**601106**	**615,444**	**629,781**	**644,119**	**658,457**	**672,795**
Former Dependents	**26,368**	**28,181**	**29,918**	**31,554**	**33,114**	**34,614**
Abstainers/Alcohol Free	15,081	16,162	17,231	18,265	19,276	20,268
Moderate Drinker	11,286	12,018	12,687	13,289	13,838	14,346
Male 18-24	5957	5983	6002	6016	6025	6031
Male 25-34	6650	6951	7217	7445	7641	7811
Male 35-54	5690	6373	7031	7649	8233	8788
Male 55+	2892	3149	3424	3709	4004	4308
Female 18-24	2622	2642	2657	2668	2676	2681
Female 25-34	746	1093	1423	1730	2014	2273
Female 35-54	1304	1434	1566	1703	1852	2013
Female 55+	508	556	597	634	670	708
Prevalence	**14,576**	**14,324**	**14,140**	**14,046**	**14,014**	**14,027**
% prev	2.42%	2.33%	2.25%	2.18%	2.13%	2.08%
Estimated In Treatment at 1 April	1,851	1,732	1,554	1,400	1,266	1,148
Not in Treatment	12,725	12,592	12,587	12,646	12,748	12,879
Male 18-24	3,532	3,498	3,472	3,453	3,438	3,428
Male 25-34	3,981	3,945	3,918	3,905	3,902	3,907
Male 35-54	3,050	2,954	2,878	2,835	2,815	2,814
Male 55+	1,120	1,091	1,066	1,050	1,041	1,040
Female 18-24	1,554	1,531	1,512	1,499	1,489	1,482
Female 25-34	445	550	629	690	739	781
Female 35-54	697	596	533	498	482	476
Female 55+	196	159	133	116	106	99
Mild	7,568	7,338	7,168	7,064	7,007	6,985
Moderate	5,626	5,607	5,594	5,599	5,616	5,641
Severe	1,145	1,160	1,171	1,183	1,194	1,205
Complex	237	219	208	201	198	197
Treatment Journeys		**1,359**	**1,421**	**1,422**	**1,441**	**1,471**
% access rate		**9.49%**	**10.05%**	**10.13%**	**10.28%**	**10.49%**
Successful		855	896	895	907	926
Not Successful		504	526	527	534	546
Male 18-24		55	58	58	58	58
Male 25-34		232	248	249	251	252
Male 35-54		541	567	565	570	579
Male 55+		135	139	135	133	132
Female 18-24		41	43	43	43	43
Female 25-34		110	151	182	207	228
Female 35-54		190	169	153	148	149
Female 55+		57	46	38	33	31
Number of People in Contact with Service on a Typical Day						
Community	430	505	502	506	516	528
Residential	11.2	13.3	13.5	13.7	14.1	14.5
Inpatient	0.4	0.4	0.5	0.5	0.5	0.5

Table 9: Incremental Results - 25% Increase in each age gender group Minus No Change (Scenario C minus Scenario A)

LEEDS		Baseline	Year 1	Year 2	Year 3	Year 4	Year 5
	offsetting ->->->->->->->->->->	5	57	109	161	213	265
Population		**0**	**0**	**0**	**0**	**0**	**0**
Former Dependents		**0**	**106**	**236**	**339**	**422**	**491**
	Abstainers/Alcohol Free	0	66	152	226	291	351
	Moderate Drinker	0	40	84	112	130	141
		0	0	0	0	0	0
	Male 18-24	0	4	9	13	15	17
	Male 25-34	0	19	42	60	74	85
	Male 35-54	0	43	95	136	169	195
	Male 55+	0	12	28	44	58	71
	Female 18-24	0	3	7	9	11	13
	Female 25-34	0	8	21	33	43	53
	Female 35-54	0	14	26	34	40	45
	Female 55+	0	4	8	10	11	12
Prevalence		**0**	**-106**	**-234**	**-333**	**-413**	**-478**
	% prev	0.00%	-0.02%	-0.04%	-0.05%	-0.06%	-0.07%
	Estimated In Treatment at 1 April	6	84	67	56	48	41
	Not in Treatment	-6	-189	-301	-389	-460	-519
	Male 18-24	0	-4	-9	-13	-15	-17
	Male 25-34	0	-19	-42	-60	-74	-85
	Male 35-54	0	-42	-95	-135	-167	-194
	Male 55+	0	-11	-27	-41	-53	-64
	Female 18-24	0	-3	-7	-9	-11	-12
	Female 25-34	0	-8	-21	-33	-43	-52
	Female 35-54	0	-14	-26	-34	-40	-44
	Female 55+	0	-4	-7	-8	-9	-9
	Mild	0	-60	-131	-184	-226	-259
	Moderate	0	-37	-83	-121	-152	-178
	Severe	0	-6	-15	-22	-28	-34
	Complex	0	-2	-5	-6	-7	-8
Treatment Journeys		0	**179**	**244**	**224**	**212**	**206**
	% access rate	0	**1.31%**	**1.86%**	**1.79%**	**1.76%**	**1.76%**
	Successful	0	111	154	141	134	129
	Not Successful	0	68	90	83	79	76
	Male 18-24	0	8	12	11	11	11
	Male 25-34	0	32	48	47	46	46
	Male 35-54	0	71	97	88	82	78
	Male 55+	0	18	25	22	20	19
	Female 18-24	0	6	8	8	8	8
	Female 25-34	0	15	25	28	30	31
	Female 35-54	0	23	23	16	13	11
	Female 55+	0	6	6	3	2	1
Number of People in Contact with Service on a Typical Day							
	Community	5	89	81	76	73	72
	Residential	0.2	2.4	2.2	2.1	2.0	2.0
	Inpatient	0.0	0.1	0.1	0.1	0.1	0.1

Table 10 Model Results for Exemplar LA - Scenario D – Trebled Access Rates (Similar order of magnitude to Scotland)

LEEDS	Baseline	Year 1	Year 2	Year 3	Year 4	Year 5
offsetting ->->->->->->->->->->	5	57	109	161	213	265
Population	**601106**	**615,444**	**629,781**	**644,119**	**658,457**	**672,795**
Former Dependents	**26,368**	**28,811**	**31,228**	**33,330**	**35,224**	**36,978**
Abstainers/Alcohol Free	15,081	16,557	18,079	19,460	20,750	21,981
Moderate Drinker	11,286	12,254	13,149	13,870	14,474	14,997
Male 18-24	5957	6013	6066	6104	6130	6148
Male 25-34	6650	7077	7492	7829	8106	8338
Male 35-54	5690	6640	7568	8357	9055	9691
Male 55+	2892	3224	3594	3954	4309	4662
Female 18-24	2622	2664	2704	2732	2751	2764
Female 25-34	746	1144	1537	1894	2217	2509
Female 35-54	1304	1484	1652	1806	1965	2135
Female 55+	508	566	614	654	692	731
Prevalence	**14,576**	**13,696**	**12,841**	**12,295**	**11,946**	**11,724**
% prev	2.42%	2.23%	2.04%	1.91%	1.81%	1.74%
Estimated In Treatment at 1 April	1,887	2,189	1,876	1,639	1,452	1,299
Not in Treatment	12,689	11,506	10,965	10,656	10,494	10,425
Male 18-24	3,532	3,469	3,408	3,365	3,334	3,312
Male 25-34	3,981	3,819	3,644	3,522	3,438	3,382
Male 35-54	3,050	2,687	2,343	2,130	2,000	1,920
Male 55+	1,120	1,017	902	820	764	727
Female 18-24	1,554	1,509	1,466	1,436	1,414	1,399
Female 25-34	445	499	514	526	536	545
Female 35-54	697	545	446	396	371	357
Female 55+	196	149	118	99	89	82
Mild	7,568	6,988	6,453	6,115	5,902	5,767
Moderate	5,626	5,380	5,118	4,947	4,835	4,762
Severe	1,145	1,119	1,083	1,059	1,043	1,032
Complex	237	209	186	173	166	163
Treatment Journeys		**2,422**	**2,713**	**2,495**	**2,388**	**2,346**
% access rate		**17.68%**	**21.13%**	**20.29%**	**19.99%**	**20.01%**
Successful		1,515	1,711	1,571	1,503	1,476
Not Successful		907	1,002	924	885	870
Male 18-24		108	138	136	135	134
Male 25-34		450	557	539	528	522
Male 35-54		988	1072	950	885	854
Male 55+		253	281	244	218	202
Female 18-24		80	101	99	97	96
Female 25-34		198	277	304	328	350
Female 35-54		272	232	182	163	158
Female 55+		72	56	41	33	29
Number of People in Contact with Service on a Typical Day						
Community	465	994	899	851	830	825
Residential	12.3	26.7	24.6	23.5	23.0	22.9
Inpatient	0.4	0.9	0.8	0.8	0.8	0.8

Table 11: Incremental Results - Trebled Access Rates (Similar order of magnitude to Scotland) Minus No Change (Scenario D minus Scenario A)

LEEDS		Baseline	Year 1	Year 2	Year 3	Year 4	Year 5
	offsetting ->->->->->->->->->>	5	57	109	161	213	265
Population		**0**	**0**	**0**	**0**	**0**	**0**
Former Dependents		**0**	**736**	**1,547**	**2,114**	**2,531**	**2,855**
	Abstainers/Alcohol Free	0	461	1,001	1,420	1,765	2,063
	Moderate Drinker	0	275	546	694	766	791
		0	0	0	0	0	0
	Male 18-24	0	34	73	101	120	134
	Male 25-34	0	144	316	444	539	612
	Male 35-54	0	309	632	844	990	1099
	Male 55+	0	87	199	289	363	425
	Female 18-24	0	25	53	73	86	96
	Female 25-34	0	60	136	197	247	289
	Female 35-54	0	64	113	138	153	166
	Female 55+	0	14	25	30	33	35
Prevalence		**0**	**-734**	**-1,534**	**-2,084**	**-2,481**	**-2,781**
	% prev	0.00%	-0.12%	-0.24%	-0.32%	-0.38%	-0.41%
	Estimated In Treatment at 1 April	42	541	390	295	233	192
	Not in Treatment	-42	-1,275	-1,923	-2,379	-2,714	-2,973
	Male 18-24	0	-34	-73	-100	-120	-133
	Male 25-34	0	-144	-316	-443	-538	-610
	Male 35-54	0	-309	-630	-839	-983	-1,087
	Male 55+	0	-85	-191	-270	-331	-377
	Female 18-24	0	-25	-53	-73	-86	-95
	Female 25-34	0	-60	-136	-197	-247	-288
	Female 35-54	0	-64	-113	-136	-151	-163
	Female 55+	0	-13	-22	-25	-26	-26
	Mild	0	-410	-846	-1,133	-1,331	-1,476
	Moderate	0	-264	-559	-772	-932	-1,056
	Severe	0	-47	-103	-145	-179	-206
	Complex	0	-13	-26	-34	-39	-42
Treatment Journeys		0	**1,241**	**1,536**	**1,297**	**1,159**	**1,080**
	% access rate	0	**9.50%**	**12.94%**	**11.96%**	**11.47%**	**11.28%**
	Successful	0	770	969	817	729	679
	Not Successful	0	471	567	480	430	401
	Male 18-24	0	61	91	90	89	88
	Male 25-34	0	250	356	337	324	316
	Male 35-54	0	518	602	473	397	353
	Male 55+	0	136	167	131	106	89
	Female 18-24	0	45	66	64	63	62
	Female 25-34	0	103	151	150	151	153
	Female 35-54	0	105	87	46	28	20
	Female 55+	0	22	16	6	2	0
Number of People in Contact with Service on a Typical Day							
	Community	40	579	478	420	387	369
	Residential	1.3	15.7	13.3	11.9	11.0	10.5
	Inpatient	0.1	0.5	0.5	0.4	0.4	0.4

Table 12 Model Results for Exemplar LA - Scenario E: 25% Reduction in Specialist Treatment Access Rates

LEEDS		Baseline	Year 1	Year 2	Year 3	Year 4	Year 5
	offsetting ->->->->->->->->->->	5	57	109	161	213	265
Population		601,106	615,444	629,781	644,119	658,457	672,795
Former Dependents		26,368	27,966	29,432	30,850	32,229	33,575
	Abstainers/Alcohol Free	15,081	16,028	16,917	17,796	18,666	19,528
	Moderate Drinker	11,286	11,938	12,515	13,054	13,563	14,046
	Male 18-24	5957	5974	5984	5990	5994	5997
	Male 25-34	6650	6914	7133	7324	7491	7638
	Male 35-54	5690	6287	6836	7366	7878	8373
	Male 55+	2892	3126	3366	3619	3883	4158
	Female 18-24	2622	2636	2644	2649	2653	2656
	Female 25-34	746	1075	1379	1661	1921	2160
	Female 35-54	1304	1406	1510	1628	1763	1912
	Female 55+	508	548	581	613	645	680
Prevalence		14,576	14,538	14,622	14,739	14,881	15,038
	% prev	2.42%	2.36%	2.32%	2.29%	2.26%	0
	Estimated In Treatment at 1 April	1,840	1,560	1,411	1,279	1,162	1056
	Not in Treatment	12,737	12,978	13,210	13,460	13,719	13982
	Male 18-24	3,532	3,507	3,491	3,478	3,469	3,462
	Male 25-34	3,981	3,982	4,002	4,026	4,052	4,079
	Male 35-54	3,050	3,040	3,073	3,116	3,168	3,225
	Male 55+	1,120	1,114	1,122	1,135	1,153	1,175
	Female 18-24	1,554	1,537	1,526	1,518	1,512	1,507
	Female 25-34	445	568	673	759	831	893
	Female 35-54	697	623	588	573	570	576
	Female 55+	196	167	148	135	126	121
	Mild	7,568	7,460	7,438	7,448	7,482	7,534
	Moderate	5,626	5,682	5,765	5,849	5,932	6,015
	Severe	1,145	1,173	1,202	1,228	1,253	1,275
	Complex	237	224	217	214	213	214
Treatment Journeys			**997**	**915**	**949**	**986**	**1,026**
	% access rate		**6.86%**	**6.26%**	**6.44%**	**6.63%**	**6.82%**
	Successful		631	576	597	621	646
	Not Successful		366	339	351	365	380
	Male 18-24		39	35	35	35	35
	Male 25-34		167	152	154	156	158
	Male 35-54		397	365	379	393	407
	Male 55+		99	88	88	89	91
	Female 18-24		29	26	26	26	26
	Female 25-34		80	98	122	143	160
	Female 35-54		143	118	115	116	121
	Female 55+		43	33	30	28	27
Number of People in Contact with Service on a Typical Day							
	Community	419	321	331	344	358	372
	Residential	11	8	9	9	10	10
	Inpatient	0	0	0	0	0	0

Table 13: Incremental Results - 25% Reduction in Specialist Treatment Access Rates Minus No Change (Scenario E minus Scenario A)

LEEDS		Baseline	Year 1	Year 2	Year 3	Year 4	Year 5
	offsetting ->->->->->->->->->->	5	57	109	161	213	265
Population		-	-	-	-	-	-
Former Dependents		-	- 109	- 250	- 365	- 463	- 548
	Abstainers/Alcohol Free	-	- 68	- 161	- 243	- 319	- 389
	Moderate Drinker	-	- 41	- 89	- 122	- 144	- 159
	Male 18-24	0	-4	-9	-13	-15	-17
	Male 25-34	0	-19	-42	-61	-76	-88
	Male 35-54	0	-44	-100	-147	-186	-220
	Male 55+	0	-12	-29	-46	-63	-79
	Female 18-24	0	-3	-7	-9	-11	-13
	Female 25-34	0	-9	-23	-36	-49	-60
	Female 35-54	0	-14	-30	-40	-49	-56
	Female 55+	0	-4	-9	-12	-14	-16
Prevalence		**-**	**109**	**247**	**360**	**454**	**533**
	% prev	0.00%	0.02%	0.04%	0.06%	0.07%	0.08%
	Estimated In Treatment at 1 April	-6	-89	-75	-65	-57	-51
	Not in Treatment	6	197	322	424	510	584
	Male 18-24	0	4	9	13	15	17
	Male 25-34	0	19	42	61	76	88
	Male 35-54	0	44	100	146	185	218
	Male 55+	0	12	28	44	58	71
	Female 18-24	0	3	7	9	11	13
	Female 25-34	0	9	23	36	49	60
	Female 35-54	0	14	30	40	48	55
	Female 55+	0	4	8	10	11	12
	Mild	0	62	139	200	250	291
	Moderate	0	38	88	129	165	197
	Severe	0	7	16	23	31	37
	Complex	0	2	5	7	8	9
Treatment Journeys							
	% access rate	**0**	**-1.32%**	**-1.93%**	**-1.90%**	**-1.89%**	**-1.90%**
	Successful	0	-114	-165	-157	-153	-151
	Not Successful	0	-70	-97	-92	-90	-89
	Male 18-24	0	-8	-12	-12	-12	-11
	Male 25-34	0	-32	-49	-48	-48	-48
	Male 35-54	0	-73	-104	-99	-95	-93
	Male 55+	0	-18	-26	-24	-23	-22
	Female 18-24	0	-6	-9	-8	-8	-8
	Female 25-34	0	-15	-27	-31	-34	-37
	Female 35-54	0	-24	-28	-22	-19	-17
	Female 55+	0	-7	-7	-5	-3	-3
Number of People in Contact with Service on a Typical Day							
	Community	-5.4	-94.6	-89.3	-86.3	-84.8	-84.3
	Residential	-0.2	-2.5	-2.4	-2.4	-2.3	-2.3
	Inpatient	0.0	-0.1	-0.1	-0.1	-0.1	-0.1

References

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). *AUDIT - The Alcohol Use Disorders Identification Test: Guidelines for Use in Primary Care (2nd edition)*. Retrieved from Geneva:

Brennan, A., Buykx, P., Pryce, R. E., Jones, A., Hill-McManus, D., Stone, T., . . . Drummond, C. (2016). *An Evidence-Based Model for Estimating Requirements for Specialist Alcohol Treatment Capacity in England - The Specialist Treatment for Alcohol Model (STreAM) Version 1.0. Final report to DH Policy Research Programme incorporating amendments following peer reviews on project PR-R4-0512-12002*. Retrieved from

Brennan, A., Meier, P., Purshouse, R., Rafia, R., Meng, Y., Hill-Macmanus, D., Angus, C., and Holmes, J. (2015) The Sheffield Alcohol Policy Model – A Mathematical Description. Health Econ., 24: 1368–1388. doi: 10.1002/hec.3105

Dawson, D. A., Goldstein, R. B., & Grant, B. F. (2007). Rates and Correlates of Relapse Among Individuals in Remission From DSM-IV Alcohol Dependence: A 3-Year Follow-Up. *Alcoholism: Clinical and Experimental Research, 31*(12), 2036-2045.

Dawson, D. A., Grant, B. F., Stinson, F. S., Chou, P. S., Huang, B., & Ruan, W. (2006). Recovery from DSM-IV alcohol dependence: United States, 2001-2002. *Alcohol Research & Health*.

Dawson, D. A., Li, T.-K., Chou, S. P., & Grant, B. F. (2009). Transitions in and out of alcohol use disorders: Their associations with conditional changes in quality of life over a 3-year follow-up interval†. *Alcohol and Alcoholism, 44*(1), 84-92.

Drummond, C., Oyefeso, A., Phillips, T., Cheeta, S., Deluca, P., Perryman, K., . . . Galea, S. (2005). *Alcohol needs assessment research project (ANARP): the 2004 national alcohol needs assessment for England*: Department of Health London.

Gill, B., Meltzer, H., Hinds, K., & Petticrew, M. (1996). Psychiatric Morbidity among Homeless People. In R. OPCS Surveys of Psychiatric Morbidity in Great Britain (Ed.). London: HMSO.

Government Statistical Datasets. Live Tables on Homelessness: TABLE 784a - Local authorities' action under the homelessness provisions of the 1985 and 1996 Housing Acts, by local authority (quarterly) https://www.gov.uk/government/statistical-data-sets/live-tables-on-homelessness

John, U., Rumpf, H. J., Bischof, G., Hapke, U., Hanke, M., & Meyer, C. (2013). Excess Mortality of Alcohol-Dependent Individuals After 14 Years and Mortality Predictors Based on Treatment Participation and Severity of Alcohol Dependence. *Alcoholism: Clinical and Experimental Research, 37*(1), 156-163.

McManus, S., Meltzer, H., Brugha, T., Bebbington, P., & Jenkins, R. (2009). *Adult psychiatric morbidity in England, 2007*. Retrieved from Leeds:

National Institute for Health and Clinical Excellence. (2011). *Alcohol-use disorders diagnosis, assessment and management of harmful drinking and alcohol dependence. National Clinical Practice Guideline 115*. Retrieved from London:

Roerecke, M., Gual, A., & Rehm, J. (2013). Reduction of alcohol consumption and subsequent mortality in alcohol use disorders: systematic review and meta-analyses. *Journal of Clinical Psychiatry, 74*(12), e1181-1189.

Rush, B. (1990). A systems-approach to estimating the required capacity of alcohol treatment services. *British Journal of Addiction, 85*(1), 49-59.

Statistics, O. f. N. (2013). Mortality Statistics: Deaths Registered in England and Wales (Series DR), 2012. Retrieved from http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-325289

Stockwell, T., Hodgson, R., Edwards, G., Taylor, C., & Rankin, H. (1979). The development of a questionnaire to measure severity of alcohol dependence. *British Journal of Addiction to Alcohol and Other Drugs, 74*(1), 79-87.

World Health Organization. (2014). Global status report on alcohol and health 2014.