



Supporting Information

Supplementary methods

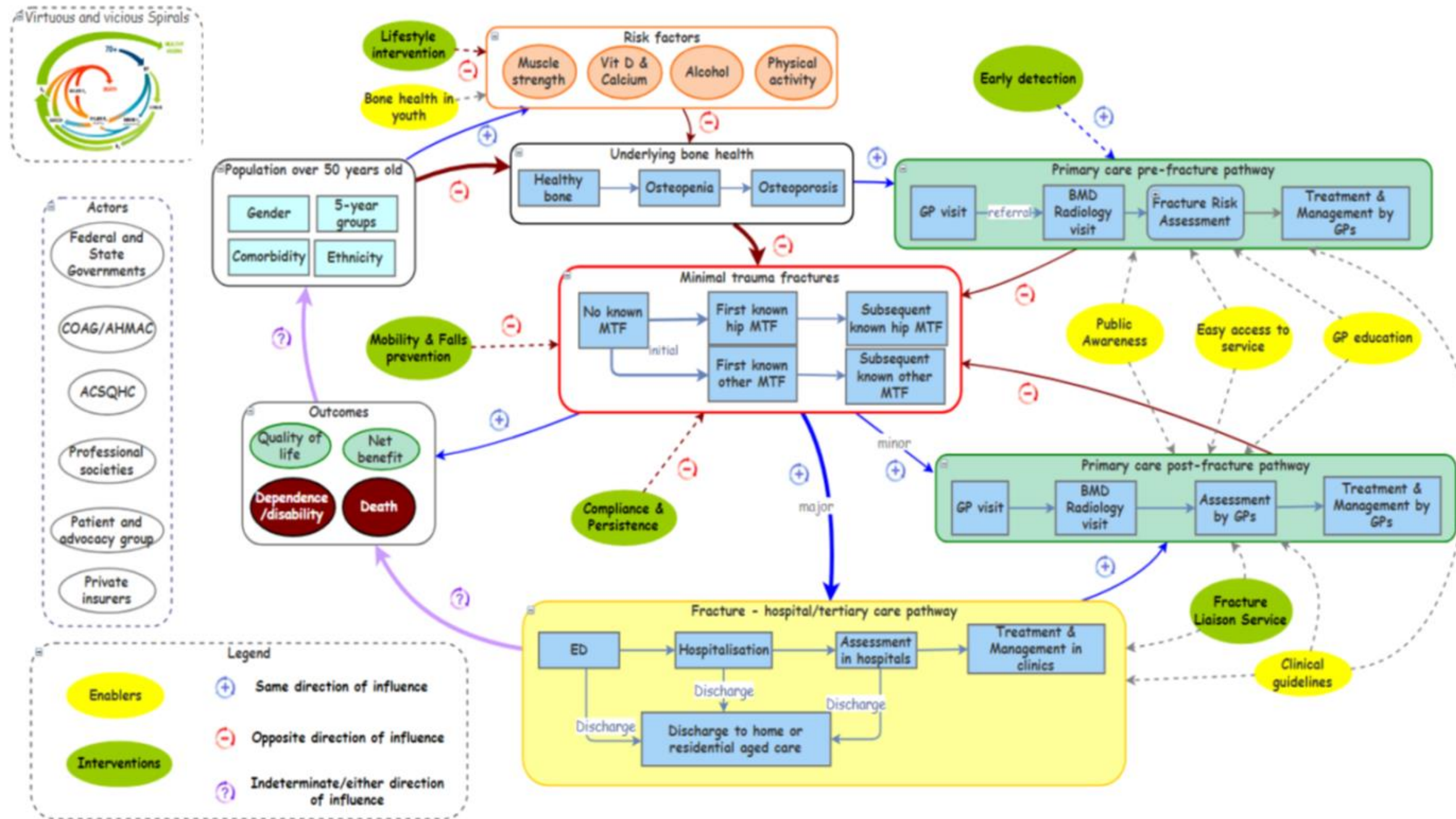
**This appendix was part of the submitted manuscript and has been peer reviewed.
It is posted as supplied by the authors.**

Appendix to: Jones AR, Currie D, Peng C, et al. Expanding access to fracture liaison services in Australia for people with minimal trauma fractures: a system dynamics modelling study. *Med J Aust* 2024; doi: 10.5694/mja2.52241.

1. System dynamics model structure

The system dynamics model was constructed to project the effects of different interventions, one of which was fracture liaison service expansion.

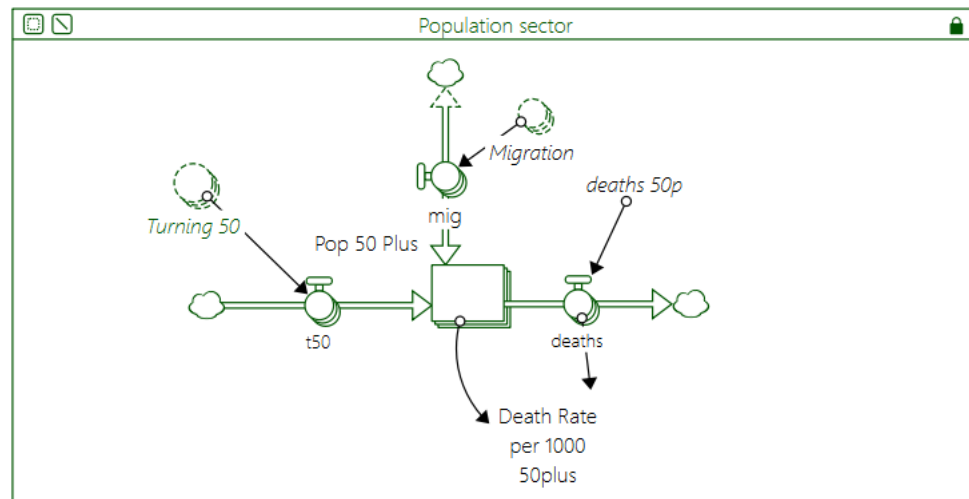
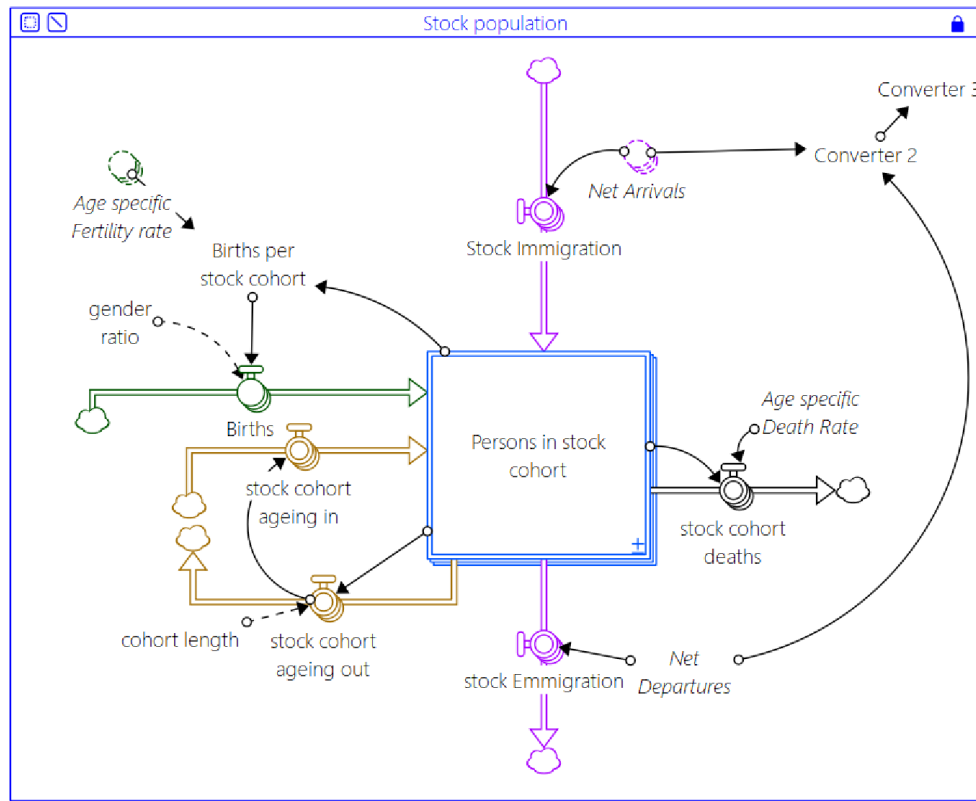
Figure 1: Overview of the model concept and different sectors



ACSQHC: Australian Commission on Safety and Quality in Health Care; AHMAC: Australian Health Ministers' Advisory Council; BMD: bone mineral density; COAG: Council of Australian Governments; ED: emergency department; GP: General practitioner; MTF: minimal trauma fracture.

A. Population sector (figure 2)

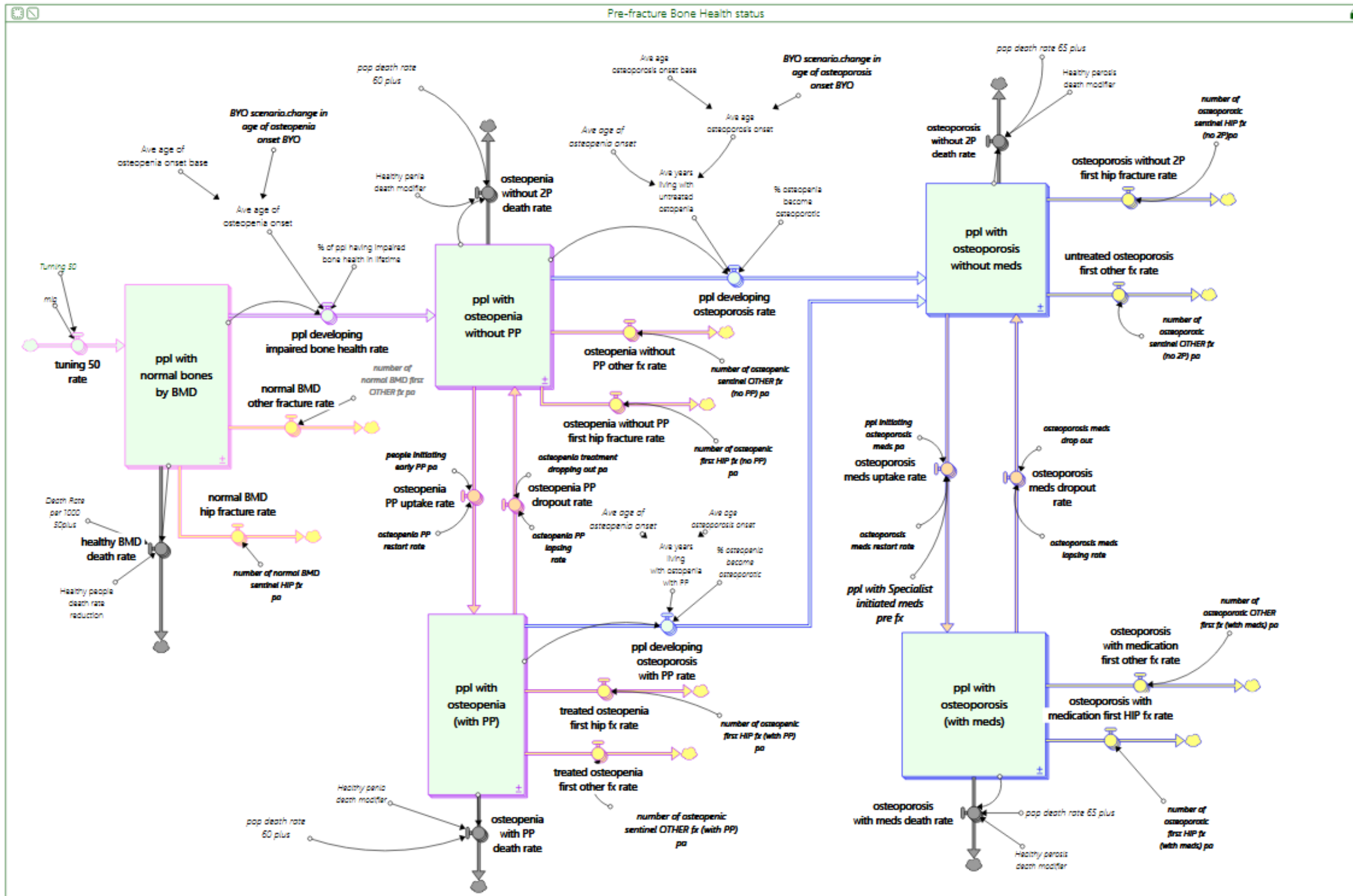
People aged ≥ 50 years, and includes immigration/emigration changes, birth and death rates.(1)



50 plus: population aged 50 or over; Pop: population.

B. Pre-fracture bone health sector (figure 3)

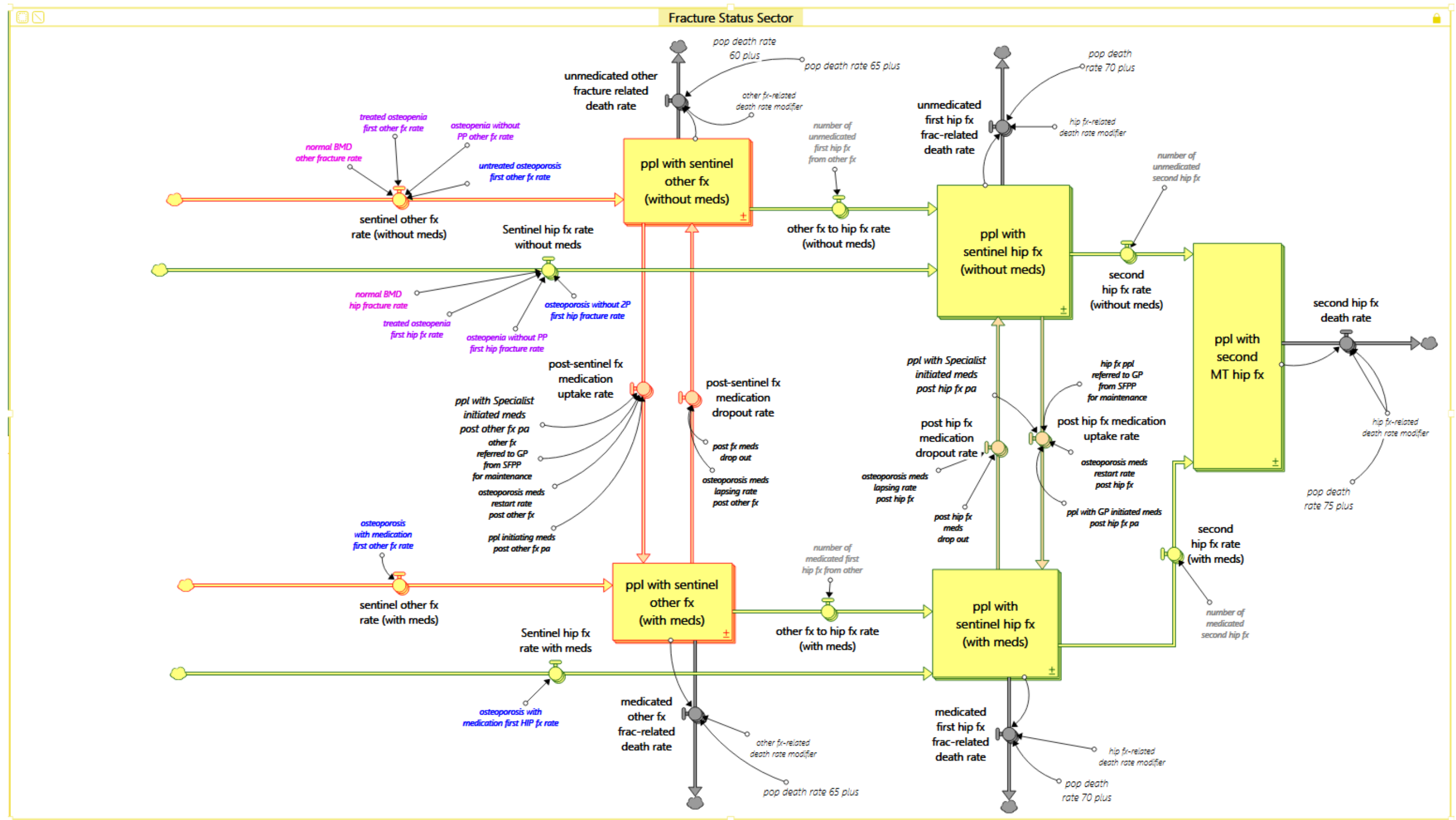
This sector captures the proportion of people ≥ 50 years who maintain normal bone mineral density (BMD), or progress to osteopenia and/or osteoporosis over time, and the proportion who start antiresorptive therapy for primary prevention. Denosumab is the most widely used antiresorptive medication in Australia, therefore the model assumed treatment effects associated with the use of denosumab.(2) The relative risk of fracture with treatment was 0.6 for hip fracture, 0.3 for vertebral fracture and 0.8 for non-hip non-vertebral fractures.(3, 4)



2P: secondary prevention; ave: mean; BMD: bone mineral density; BYO: fx: fracture; meds: medications; pa: per annum; Pop: population; PP: primary prevention; ppl: people.

C. Fracture status sector (figure 4)

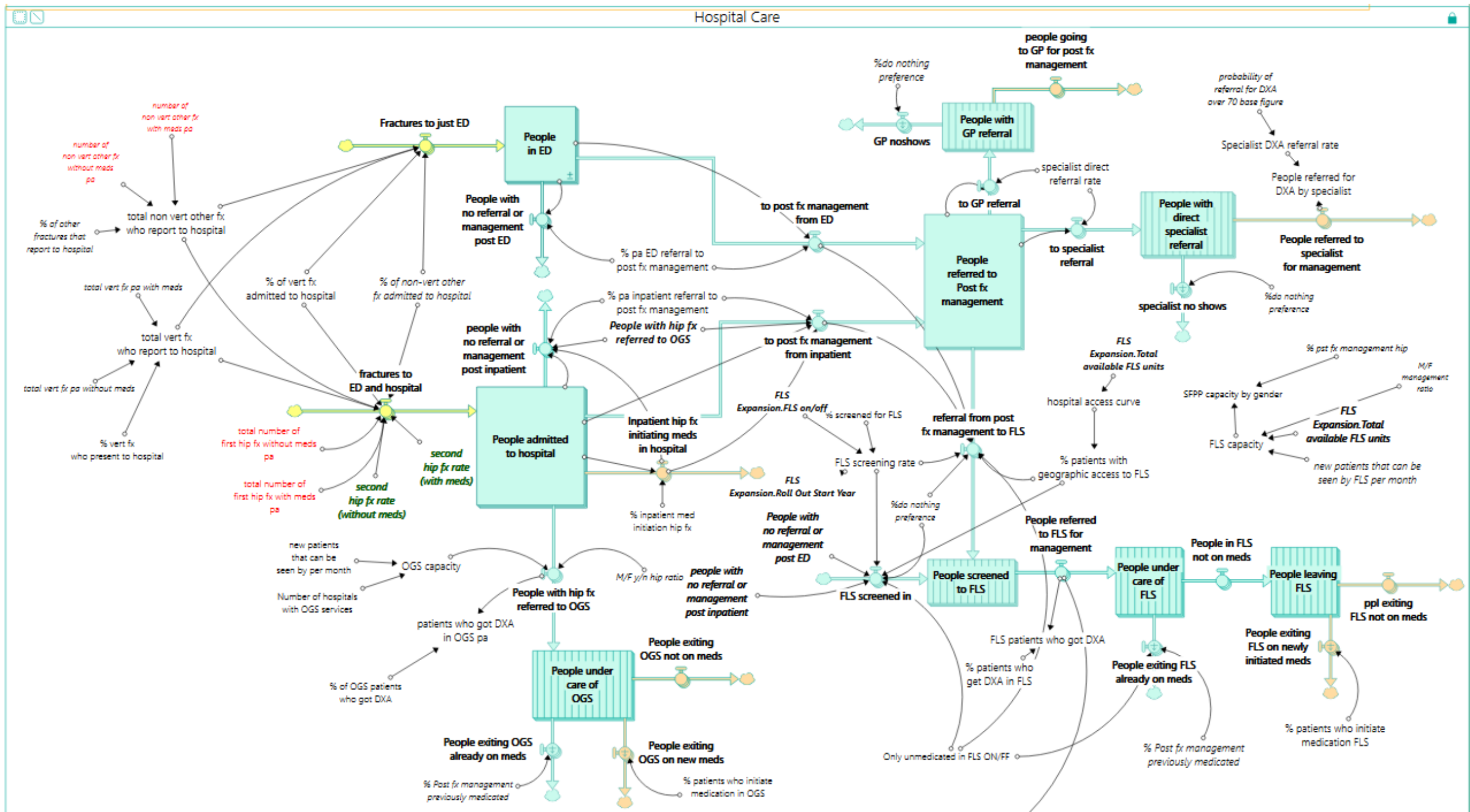
This sector captures fractures, stratified by hip and other (non-hip) fractures, and whether antiresorptive primary prevention was used prior. A proportion of individuals will commence treatment, and some will cease/restart treatment over time.(5) Those who have had a fracture are at higher risk of having a subsequent fracture, however this risk is offset by treatment.(3, 4)



BMD: bone mineral density; fx / frac: fracture; GP: general practitioner; meds: medications; MT: minimal trauma; pa: per annum; Pop: population; PP: primary prevention; ppl: people; SFPP: secondary fracture prevention program.

D. Hospital care sector (figure 5)

This sector describes the pathway after presenting to hospital with a fracture, either admission or review in the emergency department only. Thereafter, people are: (i) referred to a general practitioner (GP) or specialist for post-fracture management, (ii) referred to a fracture liaison service (FLS), (iii) managed by orthogeriatric services in hospital (OGS, predominantly hip fractures), or (iv) no post-fracture management advice. If FLS or OGS is at capacity, these people are referred to their GP or a specialist.



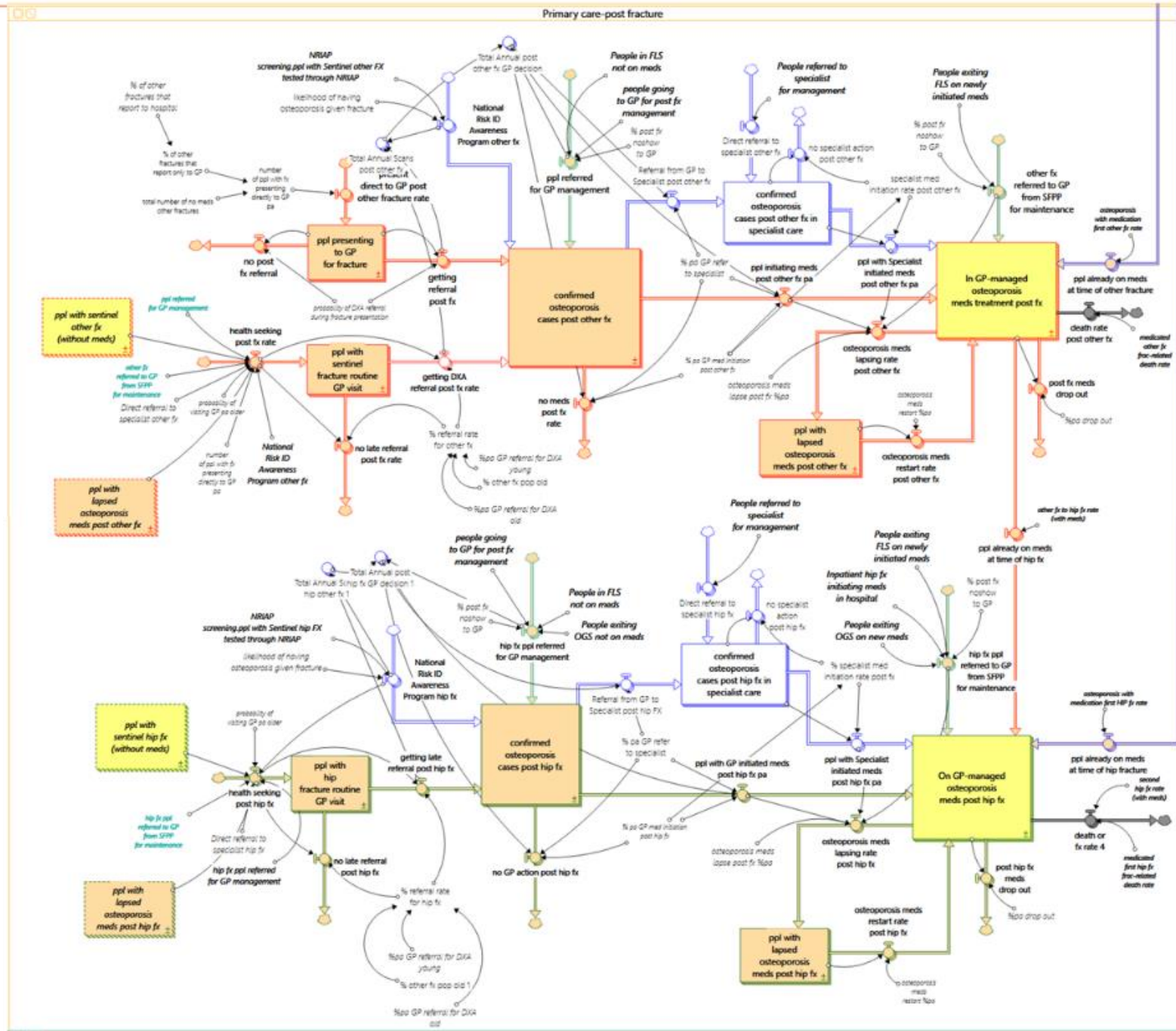
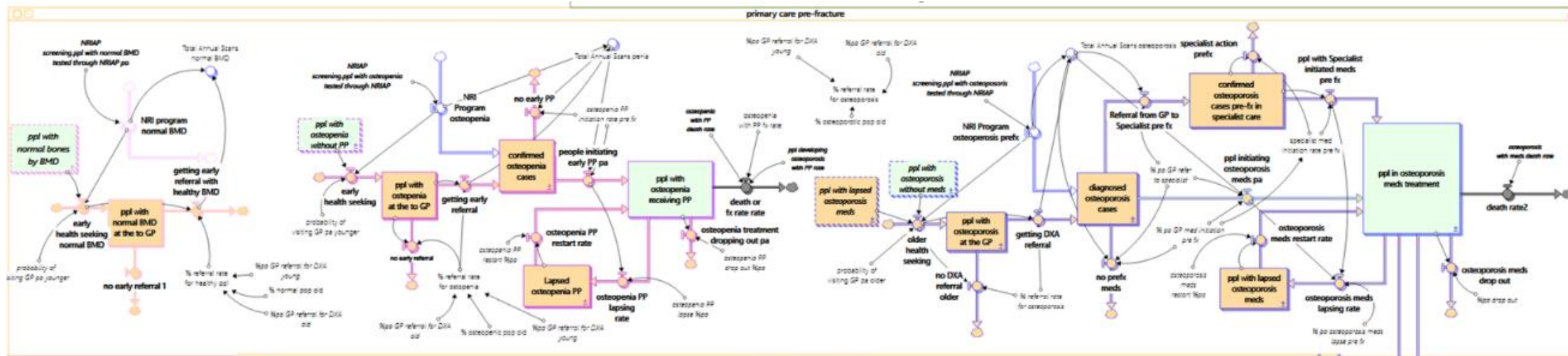
BMD: bone mineral density; DXA: Dual energy X-ray absorptiometry; fx / frac: fracture; FLS: fracture liaison service; GP: general practitioner; meds: medications; M/F: male to female; non vert: non-vertebral fracture; OGS: ortho-geriatric service; pa: per annum; Pop: population; ppl: people; SFPP: secondary fracture prevention program; vert fx: vertebral fracture.

E. Pre- and post-fracture community care sectors (figure 6)

The pre-fracture sector is stratified by bone health category and includes the frequency of attendance at a GP for people aged ≥ 50 years, likelihood of ordering (and completing) a dual-energy X-ray absorptiometry (DXA) scan, the proportion of patients starting treatment, and those who then cease/restart treatment.

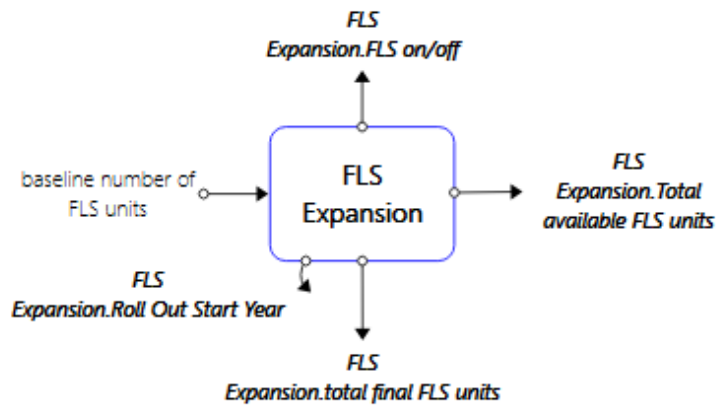
The post-fracture sector is stratified into hip and other fractures, and whether the person is on treatment at the time of fracture. A proportion will be referred for a DXA scan, start treatment, and cease/restart treatment.

BMD: bone mineral density; DXA: Dual energy X-ray absorptiometry; fx / frac: fracture; FLS: fracture liaison service; GP: general practitioner; meds: medications; NRIAP: National risk identification awareness program; NRI: National risk identification; OGS: ortho-geriatric service; pa: per annum; Pop: population; post fx: after fracture; PP: primary prevention; ppl: people; pre fx: prior to fracture; SFPP: secondary fracture prevention program.



G. FLS intervention (figure 8)

The FLS modelled was a 'Type A' FLS, involves a coordinator screening hospital records for eligible patients either admitted or presenting to the emergency department for minimal trauma fractures, contacting patients and their GP via mail, investigations including pathology, spinal X-ray and DXA, consultation with a specialist physician, treatment if indicated, follow-up phone calls with the patient and written communication to the GP. The 'business as usual' model assumes the 2018 provision of 29 FLS services across Australia. Each FLS captures or detects 30% of patients presenting to hospital with a fracture (screening rate), has the capacity to see 40 new patients per month, and assumes 30% of invited new patients fail to attend the FLS.

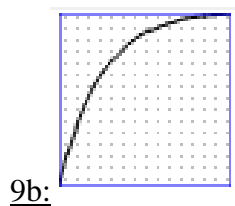
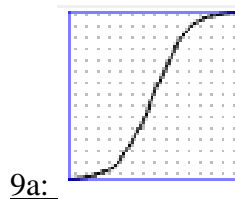


FLS: fracture liaison service

Additional notes:

- The model time steps were in years, with a delay time of 1 month
- Scenario testing was performed to project the impacts of modifying the (i) number of FLS, (ii) the FLS screening rate, (iii) FLS capacity, and (iv) the number of patients who failed to attend. The shape of implementation of these changes is shown in Figure 9.

Figure 9: Shape of implementation changes for scenario testing. A) S-shape adoption curve used to implement expanded number of FLS. B) Logarithmic curve used to implement changes in screening, capacity and failure to attend



References

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<https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/3101.0Main+Features1Mar%202019> (viewed Mar 2021)
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<https://www.pbs.gov.au/industry/listing/participants/public-release-docs/2020-10/denosumab-analysis-PBS-and-MI-dusc-prd-2020-10v2.PDF> (viewed June 2021).
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4. Reid IR. Efficacy, effectiveness and side effects of medications used to prevent fractures. *J Intern Med.* 2015;277(6):690-706.
5. Watts JJ, Abimanyi-Ochom J, Sanders KM. Osteoporosis costing all Australians: a new burden of disease analysis 2012 to 2022. Melbourne: Osteoporosis Australia, 2013.
<https://healthybonesaustralia.org.au/wp-content/uploads/2022/09/burden-of-disease-analysis-2012-2022.pdf> (viewed Feb 2021).
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<https://web.archive.org/web/20200415014557/https://www.health.nsw.gov.au/falls/Publications/incidence-cost-of-falls.pdf> (viewed Feb 2021).

Table 1. Full list of model equations and parameter values

Model Variable	Values
% drop out pa base rate	10
% initiating pre fx[Gender]	pre fx initiations/(pre fx initiations+ post fx initiations)
% pa GP med initiation post hip fx[Gender]	% pa GP med initiation post hip fx base*(1+ E-decision support tool & GP Education.ERM Intervention initiating rate multiplier)* Bone Health Media Campaign.Impact of SMC on treatment initiation rate
% pa GP med initiation post hip fx base[M]	60
% pa GP med initiation post hip fx base[F]	40
% pa GP med initiation post other fx[Gender]	% pa GP med initiation post other fx base*(1+ E-decision support tool & GP Education.ERM Intervention initiating rate multiplier)* Bone Health Media Campaign.Impact of SMC on treatment initiation rate
% pa GP med initiation post other fx base[M]	60
% pa GP med initiation post other fx base[F]	40
% pa GP med initiation pre fx[Gender]	% pa GP med initiation pre fx base*(1+ E-decision support tool & GP Education.ERM Intervention initiating rate multiplier)* Bone Health Media Campaign.Impact of SMC on treatment initiation rate
% pa GP med initiation pre fx base[M]	40
% pa GP med initiation pre fx base[F]	25
% pa osteoporosis meds lapse pre fx[M]	% pa osteoporosis meds lapse pre fx base[M]*medicine lapse scaling*Bone Health Media Campaign.Impact of SMC on quit rate
% pa osteoporosis meds lapse pre fx[F]	% pa osteoporosis meds lapse pre fx base[M]*medicine lapse scaling*Bone Health Media Campaign.Impact of SMC on quit rate
%do nothing preference[Gender]	%do nothing preference base rate*Bone Health Media Campaign.Impact of SMC on do nothing rate
%do nothing preference base rate[M]	40
%do nothing preference base rate[F]	40
%pa drop out[Gender]	Bone Health Media Campaign.Impact of SMC on quit rate*% drop out pa base rate
%pa GP referral for DXA old[M]	probability of referral for DXA over 70 base figure[M]*(1+ E-decision support tool & GP Education.ERM Intervention DXA referral multiplier)*Bone Health Media Campaign.Impact of SMC on DXA scan rate*DXA ramping old[M]
%pa GP referral for DXA old[F]	probability of referral for DXA over 70 base figure[F]*(1+ E-decision support tool & GP Education.ERM Intervention DXA referral multiplier)* Bone Health Media Campaign.Impact of SMC on DXA scan rate*DXA ramping old[F]
%pa GP referral for DXA young[M]	probability of referral for DXA under 70 base figure[M]* (1+ E-decision support tool & GP Education.ERM Intervention DXA referral multiplier)* Bone Health Media Campaign.Impact of SMC on DXA scan rate
%pa GP referral for DXA young[F]	probability of referral for DXA under 70 base figure[F]*(1+ E-decision support tool & GP Education.ERM Intervention DXA referral multiplier)* Bone Health Media Campaign.Impact of SMC on DXA scan rate

Model Variable	Values
%pa osteoporosis meds lapse post fx base[M]	40
%pa osteoporosis meds lapse post fx base[F]	40
%pa osteoporosis meds lapse pre fx base[M]	40
%pa osteoporosis meds lapse pre fx base[F]	40
%pa osteoporosis meds restart base[M]	50
%pa osteoporosis meds restart base[F]	50
DXA ramping old[M]	GRAPH(TIME)(2011.000, 0.448100836), (2012.000, 0.540100836), (2013.000, 0.632100836), (2014.000, 0.724100836), (2015.000, 0.816100836), (2016.000, 0.908100836), (2017.000, 1.000)
DXA ramping old[F]	GRAPH(TIME)(2011.000, 0.610025837), (2012.000, 0.675025837), (2013.000, 0.740025837), (2014.000, 0.805025837), (2015.000, 0.870025837), (2016.000, 0.935025837), (2017.000, 1.0)
medicine lapse scaling	GRAPH(TIME) (2011.000, 1.156426), (2012.000, 1.130355), (2013.000, 1.104284), (2014.000, 1.078213), (2015.000, 1.052142), (2016.000, 1.026071), (2017.000, 1.000), (2018.000, 1.000)
osteoporosis meds restart %pa[Gender]	(1+ E-decision support tool & GP Education.ERM Intervention restart rate multiplier)*%pa osteoporosis meds restart base
percent med[Gender]	osteoporosis medicated/total osteoporosis
post fx initiations[Gender]	hip fx ppl referred to GP from SFPP for maintenance+ ppl initiating meds post other fx pa+ ppl referred to GP from SFPP for maintenance+ ppl with GP initiated meds post hip fx pa+ ppl with Specialist initiated meds post hip fx pa+ ppl with Specialist initiated meds post other fx pa
ppl on treatment	SUM(In GP-managed osteoporosis meds treatment post fx[*])+ SUM(On GP-managed osteoporosis meds post hip fx[*])+ SUM(ppl in osteoporosis meds treatment[*])
pre fx initiations[Gender]	ppl initiating osteoporosis meds pa+ ppl with Specialist initiated meds pre fx
probability of DXA referral during fx presentation[M]	probability of referral for DXA over 70 base figure[M]*(1+ E-decision support tool & GP Education.ERM Intervention DXA referral multiplier)*Bone Health Media Campaign.Impact of SMC on DXA scan rate
probability of DXA referral during fx presentation[F]	probability of referral for DXA over 70 base figure[F]*(1+ E-decision support tool & GP Education.ERM Intervention DXA referral multiplier)*Bone Health Media Campaign.Impact of SMC on DXA scan rate
probability of referral for DXA over 70 base figure[M]	3.5
probability of referral for DXA over 70 base figure[F]	10
probability of referral for DXA under 70 base figure[M]	3
probability of referral for DXA under 70 base figure[F]	9
total hospital visits	SUM(People admitted to hospital[*,*,*])+ SUM(People in ED[*,*,*])
Vitamin D cost per Day[Fed]	0
Vitamin D cost per Day[Sta]	0

Model Variable	Values
Vitamin D cost per Day[OOP]	(27.99/300)
FLS Expansion.Effective roll out PHNs	.baseline number of FLS units+ Roll out PHNs*(Roll out shape/100)
FLS Expansion."FLS on/off"	0
FLS Expansion.Roll Out length	10
FLS Expansion.Roll out PHNs	total final FLS units-.baseline number of FLS units
FLS Expansion.Roll out shape	(0.0, 0.0), (10.0, 1.0), (20.0, 3.9), (30.0, 11.4), (40.0, 30.3), (50.0, 51.4), (60.0, 74.7), (70.0, 88.0), (80.0, 92.6), (90.0, 96.8), (100.0, 100.0)GRAPH((TIME-Roll Out Start Year)/Roll Out length*100)
FLS Expansion.Roll Out Start Year	2021
FLS Expansion.Total available FLS units	IF FLS on/off = 1 THEN Effective roll out PHNs ELSE .baseline number of FLS units
FLS Expansion.total final FLS units	100

Burden of Disease:	

% deaths attributable to hip fx[M]	25
% deaths attributable to hip fx[F]	25
Cost per DALY	50000
life years lost from hip fx[M]	2.7*4
life years lost from hip fx[F]	0.9*4
Other fx disability weight	0.053
Sentinel hip fx disability weight	0.258
Subsequent hip fx disability weight	Sentinel hip fx disability weight*2
total cost of of DALYs pa	total DALYs from fx*Cost per DALY
total DALYs from fx	(YLD due to other fx+ total DALYs from hip fx)*NPV factor
total DALYs from hip fx	Total YLD from hip fx+ SUM(YLL from hip fx)
Total YLD from hip fx	YLD due to first hip fx+ YLD due to subsequent hip fx
YLD due to first hip fx	(SUM(ppl with sentinel hip fx (without meds))+ SUM(ppl with sentinel hip fx (with meds)))*Sentinel hip fx disability weight
YLD due to other fx	(SUM(ppl with sentinel other fx (without meds))+ SUM(ppl with sentinel other fx (with meds)))*Other fx disability weight

Model Variable	Values
YLD due to subsequent hip fx	SUM(ppl with second MT hip fx)*Subsequent hip fx disability weight
YLL from hip fx[Gender]	((medicated first hip fx fx-related death rate+ unmedicated first hip fx fx-related death rate)*(% deaths attributable to hip fx/100)*1 IF e years lost from hip fx)+ (second hip fx death rate*(% deaths attributable to hip fx/100)*(1 IF e years lost from hip fx/2))

Costing:	

% admitted other fx hospitalised[M]	85
% admitted other fx hospitalised[F]	85
% Hip fx new RACF admissions[M]	11
% Hip fx new RACF admissions[F]	11
% Hip fx using CC[M]	8
% Hip fx using CC[F]	28
% Hip fx using HH[M]	27
% Hip fx using HH[F]	33
% Hip fx using MOW[M]	3
% Hip fx using MOW[F]	6
% Hip fx using physio[M]	65
% Hip fx using physio[F]	65
% medicated concession non-safetynet[M]	70
% medicated concession non-safetynet[F]	70
% medicated concession nsafetynet[M]	15
% medicated concession nsafetynet[F]	15
% medicated non concession[M]	15
% medicated non concession[F]	15
% Other fx new RACF admission[M]	1
% Other fx new RACF admission[F]	1
% Other fx using CC[M]	24.1

Model Variable	Values
% Other fx using CC[F]	21.1
% Other fx using HH[M]	13
% Other fx using HH[F]	30
% Other fx using MOW[M]	10
% Other fx using MOW[F]	6
% Other fx using physio[M]	52
% Other fx using physio[F]	52
% patients doing rehab in public hospital[M, Otherfx]	32
% patients doing rehab in public hospital[M, Hipfx]	40
% patients doing rehab in public hospital[F, Otherfx]	32
% patients doing rehab in public hospital[F, Hipfx]	40
% patients sent to rehab[M, Otherfx]	14
% patients sent to rehab[M, Hipfx]	32
% patients sent to rehab[F, Otherfx]	14
% patients sent to rehab[F, Hipfx]	32
% patients treated in public hospitals[M]	85.4
% patients treated in public hospitals[F]	85.4
% patients using ambulance[M, Otherfx]	62
% patients using ambulance[M, Hipfx]	100
% patients using ambulance[F, Otherfx]	48
% patients using ambulance[F, Hipfx]	93
% private in public hospital hospitalised patients	13.8
Admitted patients Hospitalised[M, Otherfx]	$SUM(\text{fx to ED and hospital}[M, *, \text{Otherfx}]) * (\% \text{ admitted other fx hospitalised}[M]/100) * (\% \text{ patients treated in public hospitals}[M]/100)$
Admitted patients Hospitalised[M, Hipfx]	$SUM(\text{fx to ED and hospital}[M, *, \text{Hipfx}]) * (\% \text{ patients treated in public hospitals}[M]/100)$
Admitted patients Hospitalised[F, Otherfx]	$SUM(\text{fx to ED and hospital}[F, *, \text{Otherfx}]) * (\% \text{ admitted other fx hospitalised}[F]/100) * (\% \text{ patients treated in public hospitals}[F]/100)$
Admitted patients Hospitalised[F, Hipfx]	$SUM(\text{fx to ED and hospital}[F, *, \text{Hipfx}]) * (\% \text{ patients treated in public hospitals}[F]/100)$
Admitted patients on Short Stay[M, Otherfx]	$SUM(\text{fx to ED and hospital}[M, *, \text{Otherfx}]) * (1 - (\% \text{ admitted other fx hospitalised}[M]/100)) * (\% \text{ patients treated in public hospitals}[M]/100)$

Model Variable	Values
Admitted patients on Short Stay[M, Hipfx]	0
Admitted patients on Short Stay[F, Otherfx]	$SUM(fx \text{ to ED and hospital}[F, *, Otherfx]) * (1 - (\% \text{ admitted other fx hospitalised}[F]/100)) * (\% \text{ patients treated in public hospitals}[F]/100)$
Admitted patients on Short Stay[F, Hipfx]	0
Ambulance unit cost[Federal]	0
Ambulance unit cost[State]	380
Ambulance unit cost[OOP]	495
Annual Ambulance Cost[Gender, Funding level]	$((Hospital \text{ visits by fx type and gender}[Gender, Otherfx]) * (\% \text{ patients using ambulance}[Gender, Otherfx]/100) * Ambulance \text{ unit cost}[Funding \text{ level}]) + (Hospital \text{ visits by fx type and gender}[Gender, Hipfx]) * (\% \text{ patients using ambulance}[Gender, Hipfx]/100) * Ambulance \text{ unit cost}[Funding \text{ level}]) * inflation \text{ modifier} * NPV \text{ factor}$
Annual Ambulance Cost by payer[Funding level]	$SUM(Annual \text{ Ambulance Cost}[*, Funding \text{ level}])$
Annual Annual Ambulance Cost over study period[Gender, Funding level]	Annual Ambulance Cost
Annual community care cost[M, Federal]	0
Annual community care cost[M, State]	0
Annual community care cost[M, OOP]	$((total \text{ number of new hip fx pa}[M] * (\% \text{ Hip fx using CC}[M]/100) * Informal \text{ community care unit cost per patient}[M, Hipfx]) * inflation \text{ modifier}) + (total \text{ new other fx}[M] * (\% \text{ Other fx using CC}[M]/100) * Informal \text{ community care unit cost per patient}[M, Otherfx]) * inflation \text{ modifier} * NPV \text{ factor}$
Annual community care cost[F, Federal]	0
Annual community care cost[F, State]	0
Annual community care cost[F, OOP]	$((total \text{ number of new hip fx pa}[F] * (\% \text{ Hip fx using CC}[F]/100) * Informal \text{ CC unit cost per patient}[F, Hipfx]) * inflation \text{ modifier}) + (total \text{ new other fx}[F] * (\% \text{ Other fx using CC}[F]/100) * Informal \text{ CC unit cost per patient}[F, Otherfx]) * inflation \text{ modifier} * NPV \text{ factor}$
Annual community physio cost[Gender, Funding level]	$((total \text{ new other fx}[Gender] * (\% \text{ Other fx using physio}[Gender]/100)) * (Community \text{ physio OTHER FX unit cost - item 10960}[Funding \text{ level}] * inflation \text{ modifier})) + ((total \text{ number of new hip fx pa}[Gender] * (\% \text{ Hip fx using physio}[Gender]/100)) * (Community \text{ physio HIP FX unit cost - item 10960}[Funding \text{ level}])) * inflation \text{ modifier} * NPV \text{ factor}$
Annual community physio cost by gender 1[Gender]	$SUM(Annual \text{ community physio cost}[Gender, *])$
Annual community physio cost by payer[Funding level]	$SUM(Annual \text{ community physio cost}[*, Funding \text{ level}])$
Annual community physio cost over study period[Gender, Funding level]	Annual community physio cost
Annual community service cost[Gender, Funding level]	Annual MOW cost+ Annual community care cost+ Annual home help cost

Model Variable	Values
Annual community service cost study period 1[Gender, Funding level]	Annual community service cost
Annual community XRAY for fx cost[Gender, Funding level]	(present direct to GP post other fx rate[Gender]*Community managed fx XRAY unit cost - Item 57515[Funding level])*inflation modifier*NPV factor
Annual community XRAY for fx cost by gender[Gender]	SUM(Annual community XRAY for fxcost[Gender,*])
Annual community XRAY for fx cost by payer[Funding level]	SUM(Annual community XRAY for fx cost[* ,Funding level])
Annual community XRAY for fx cost over study period[Gender, Funding level]	Annual community XRAY for fx cost
Annual cost modifier	IF TIME<=2018 THEN Cost deflator value ELSE cost inflator %pa
Annual cost pa gender[Gender]	SUM(Annual OGS cost[Gender,*])
Annual discount rate	IF TIME<=2018 THEN Cost deflator value 1 ELSE npv discount rate %pa
Annual DXA cost[Gender, Funding level]	(total DXA referrals Pa by gender[Gender]*DXA scan outpatient referral unit cost - item 12306[Funding level])*inflation modifier*NPV factor
Annual DXA cost pa gender[Gender]	SUM(Annual DXA cost[Gender,*])
Annual ED only hospital visit cost[Gender, Funding level]	(SUM(ED only patients[Gender,*])*ED only hospital visit unit cost - URG 58[Funding level]*(% patients treated in public hospitals[Gender]/100))*NPV factor*inflation modifier
Annual FLS cost pa gender[Gender]	SUM(Annual SFPP cost[Gender,*])
Annual home help cost[M, Federal]	((total number of new hip fx pa[M]*(% Hip fx using HH[M]/100)*HH unit cost per patient[M,Hipfx]*inflation modifier)+ (total new other fx[M]*(% Other fx using HH[M]/100)*HH unit cost per patient[M,Otherfx]))*inflation modifier*NPV factor
Annual home help cost[M, State]	0
Annual home help cost[M, OOP]	0
Annual home help cost[F, Federal]	((total number of new hip fx pa[F]*(% Hip fx using HH[F]/100)*HH unit cost per patient[F,Hipfx]*inflation modifier)+ (total new other fx[F]*(% Other fx using HH[F]/100)*HH unit cost per patient[F,Otherfx]))*inflation modifier*NPV factor
Annual home help cost[F, State]	0
Annual home help cost[F, OOP]	0
Annual hospitalised hip fx costs[Gender, Funding level]	hospitalized persons costs[Gender,Hipfx,Funding level]*inflation modifier*NPV factor
Annual hospitalised hip fx costs by payer[Funding level]	SUM(Annual hospitalised hip fx costs[* ,Funding level])

Model Variable	Values
Annual hospitalised hip fx costs over study period[Gender, Funding level]	Annual hospitalised hip fx costs
Annual hospitalised hip fx costspa gender[Gender]	SUM(Annual hospitalised hip fx costs[Gender,*])
Annual hospitalised other fx costs[Gender, Funding level]	hospitalized persons costs[Gender,Hipfx,Funding level]*inflation modifier*NPV factor
Annual hospitalised other fx costs by payer[Funding level]	SUM(Annual hospitalised other fx costs[* ,Funding level])
Annual hospitalised other fx costs over study period[Gender, Funding level]	Annual hospitalised other fx costs
Annual hospitalised other fx costspa gender[Gender]	SUM(Annual hospitalised other fx costs[Gender,*])
Annual Item 110+116 cost[Gender, Funding level]	((Total specialist initiations[Gender]*specialist initial visit unit cost - item 110[Funding level]) + (specialist subsequent visits[Gender]* specialist subsequent visit unit cost - item 116[Funding level])) *inflation modifier*NPV factor
Annual Item 23 cost[Gender, Funding level]	(Total GP visits pa[Gender]*GP visit unit cost - item 23[Funding level]*inflation modifier)*NPV factor
Annual medication cost[Gender, Funding level]	((Total medicated population pa[Gender]*(% medicated non concession[Gender]/100)*Medication pa non-concession unit cost[Funding level]) + (Total medicated population pa[Gender]*(% medicated concession non-safetynet[Gender]/100)*Medication pa concession unit cost[Funding level]) + (Total medicated population pa[Gender]*(% medicated concession nsafetynet[Gender]/100)*Medication pa safetynet unit cost[Funding level]))*inflation modifier*NPV factor
Annual MOW cost[Gender, Funding level]	((total new other fx[Gender]*(% Other fx using MOW[Gender]/100))*(meals on wheels per patient unit cost[Funding level]*inflation modifier) + ((total number of new hip fx pa[Gender]*(% Hip fx using MOW[Gender]/100))*(meals on wheels per patient unit cost[Funding level]))*NPV factor*inflation modifier
Annual OGS cost[Gender, Funding level]	(SUM(ppl with hip fx referred to OGS[Gender,* ,*])*OGS per patient unit cost[Funding level])*inflation modifier*NPV factor
Annual pathology cost[Gender, Funding level]	((patients initiating treatment pa[Gender]*pathology medication-initiation unit cost- multiple items[Funding level]) + (Total medicated population pa[Gender]*pathology medication-maintenance unit cost[Funding level]))*inflation modifier*NPV factor
Annual RAC admission cost[Gender, Funding level]	fx related new RACF admissions[Gender]*RACF per patient unit cost[Funding level]*inflation modifier*NPV factor
Annual Rehab costs[Gender, Funding level]	((Admitted patients on Short Stay[Gender,Otherfx]*(% patients doing rehab in public hospital[Gender,Otherfx]/100)*(% patients sent to rehab[Gender,Otherfx]/100)*Post fx rehabilitation unit cost[Funding level,Otherfx]) + (Admitted patients Hospitalised[Gender,Otherfx]*(% patients doing rehab in public hospital[Gender,Otherfx]/100)*(% patients sent to rehab[Gender,Otherfx]/100)*Post fx rehabilitation unit cost[Funding level,Otherfx]) + (Admitted patients Hospitalised[Gender,Hipfx]*(% patients doing rehab in public hospital[Gender,Hipfx]/100)*(% patients sent to rehab[Gender,Hipfx]/100)*Post fx rehabilitation unit cost[Funding level,Hipfx]))*inflation modifier*NPV factor
Annual SFPP cost[Gender, Funding level]	(SUM(ppl referred to FLS for management[Gender,*])*FLS per patient unit cost[Funding level])*inflation modifier*NPV factor
Annual short stay other fx cost[Gender, Funding level]	Shortstay persons cost[Gender,Hipfx,Funding level]*inflation modifier*NPV factor

Model Variable	Values
Annual total cost	SUM(total base expenditures by gender and payers)+ SUM(total intervention related expenditures by gender and payers)+ total cost of of DALYs pa
changes in inflation	Inflation over time*Annual cost modifier/100
changes in NPV factor	Inflation over time 1*Annual discount rate/100
Community managed fx XRAY unit cost - Item 57515[Fed]	45.9
Community managed fx XRAY unit cost - Item 57515[Sta]	0
Community managed fx XRAY unit cost - Item 57515[OOP]	3.72
Community physio hip fx unit cost - item 10960[Fed]	476
Community physio hip fx unit cost - item 10960[Sta]	0
Community physio hip fx unit cost - item 10960[OOP]	84
Community physio OTHER fx unit cost - item 10960[Fed]	291
Community physio OTHER fx unit cost - item 10960[Sta]	0
Community physio OTHER fx unit cost - item 10960[OOP]	51
Cost deflator value	1
NPV value	0
cost inflator %pa	1.1
DXA scan outpatient referral unit cost - item 12306[Fed]	87.04
DXA scan outpatient referral unit cost - item 12306[Sta]	0
DXA scan outpatient referral unit cost - item 12306[OOP]	(102.40-87.04)+ 21.89{15%+ OOPforDXimaging }
ED only hospital visit unit cost - URG 58[Federal]	0
ED only hospital visit unit cost - URG 58[State]	470
ED only hospital visit unit cost - URG 58[OOP]	0
ED only patients[M, Otherfx]	SUM(fx to just ED[M,*,Otherfx])

Model Variable	Values
ED only patients[M, Hipfx]	0
ED only patients[F, Otherfx]	SUM(fx to just ED[F,*,Otherfx])
ED only patients[F, Hipfx]	0
Flow 43[Funding level]	total base expenditure by payer
Flow 44[Funding level]	IF TIME>=2019 THEN total base expenditure by payer ELSE 0
FLS cost over study period[Gender, Funding level]	Annual SFPP cost
FLS per patient unit cost[Federal]	130.18+ (65.15*0.55)+ 102.21{initial110+ (subsequent116*0.55)+ pathology }
FLS per patient unit cost[State]	452.41 {overhead }
FLS per patient unit cost[OOP]	0
FX related new RACF admissions[Gender]	((SUM(People admitted to hospital[Gender,*,Otherfx])*(% Other fx new RACF admission[Gender]/100))+ (SUM(People admitted to hospital[Gender,*,Hipfx])*(% Hip fx new RACF admissions[Gender]/100)))
GP visit unit cost - item 23[Federal]	37.6
GP visit unit cost - item 23[State]	0
GP visit unit cost - item 23[OOP]	5.07
GP visting multiplier	2
home help unit cost per patient[M, Otherfx]	797
home help unit cost per patient[M, Hipfx]	2445
home help unit cost per patient[F, Otherfx]	1431
home help unit cost per patient[F, Hipfx]	1781
Hospital visits by fx type and gender[Gender, FxT]	SUM(People in ED[Gender,*,FxT])+ SUM(fx to ED and hospital[Gender,*,FxT])
Hospitalisation Hip fx major complexity unit cost - DRG 103a[Federal]	0
Hospitalisation Hip fx major complexity unit cost - DRG 103a[State]	33657
Hospitalisation Hip fx major complexity unit cost - DRG 103a[OOP]	0
Hospitalisation Hip fx major complexity unit cost - DRG 103a private in public[Federal]	0
Hospitalisation Hip fx major complexity unit cost - DRG 103a private in public[State]	24134

Model Variable	Values
Hospitalisation Hip fx major complexity unit cost - DRG 103a private in public[OOP]	0
Hospitalisation Other fx major complexity DRG 179a[Federal]	0
Hospitalisation Other fx major complexity DRG 179a[State]	20560
Hospitalisation Other fx major complexity DRG 179a[OOP]	0
Hospitalisation Other fx major complexity DRG 179a private in public[Federal]	0
Hospitalisation Other fx major complexity DRG 179a private in public[State]	17285
Hospitalisation Other fx major complexity DRG 179a private in public[OOP]	0
hospitalized persons costs[M, Otherfx, Federal]	Admitted patients Hospitalised[M,Otherfx]*(1-(% private in public hospital hospitalised patients/100))* Hospitalisation Other fx major complexity DRG 179a[Federal]+ (Admitted patients Hospitalised[M,Otherfx]*(% private in public hospital hospitalised patients/100) *Hospitalisation Other fx major complexity DRG 179a private in public[Federal])
hospitalized persons costs[M, Otherfx, State]	Admitted patients Hospitalised[M,Otherfx]*(1-(% private in public hospital hospitalised patients/100))*Hospitalisation Other fx major complexity DRG 179a[State]+ (Admitted patients Hospitalised[M,Otherfx]*(% private in public hospital hospitalised patients/100)*Hospitalisation Other fx major complexity DRG 179a private in public[State])
hospitalized persons costs[M, Otherfx, OOP]	Admitted patients Hospitalised[M,Otherfx]*(1-(% private in public hospital hospitalised patients/100))*Hospitalisation Other fx major complexity DRG 179a[OOP]+ (Admitted patients Hospitalised[M,Otherfx]*(% private in public hospital hospitalised patients/100)*Hospitalisation Other fx major complexity DRG 179a private in public[OOP])
hospitalized persons costs[M, Hipfx, Federal]	(Admitted patients Hospitalised[M,Hipfx]*(1-(% private in public hospital hospitalised patients/100))*Hospitalisation Hip fx major complexity unit cost - DRG 103a[Federal])+ (Admitted patients Hospitalised[M,Hipfx]*(% private in public hospital hospitalised patients/100)*Hospitalisation Hip fx major complexity unit cost - DRG 103a private in public[Federal])
hospitalized persons costs[M, Hipfx, State]	(Admitted patients Hospitalised[M,Hipfx]*(1-(% private in public hospital hospitalised patients/100))*Hospitalisation Hip fx major complexity unit cost - DRG 103a[State])+ (Admitted patients Hospitalised[M,Hipfx]*(% private in public hospital hospitalised patients/100)*Hospitalisation Hip fx major complexity unit cost - DRG 103a private in public[State])
hospitalized persons costs[M, Hipfx, OOP]	(Admitted patients Hospitalised[M,Hipfx]*(1-(% private in public hospital hospitalised patients/100))*Hospitalisation Hip fx major complexity unit cost - DRG 103a[OOP])+ (Admitted patients Hospitalised[M,Hipfx]*(% private in public hospital hospitalised patients/100)*Hospitalisation Hip fx major complexity unit cost - DRG 103a private in public[OOP])
hospitalized persons costs[F, Otherfx, Federal]	Admitted patients Hospitalised[F,Otherfx]*(1-(% private in public hospital hospitalised patients/100))*Hospitalisation Other fx major complexity DRG 179a[Federal]+ (Admitted patients Hospitalised[F,Otherfx]*(% private in public hospital hospitalised patients/100)*Hospitalisation Other fx major complexity DRG 179a private in public[Federal])

Model Variable	Values
hospitalized persons costs[F, Otherfx, State]	Admitted patients Hospitalised[F,Otherfx]*(1-(% private in public hospital hospitalised patients/100))*Hospitalisation Other fx major complexity DRG 179a[State]+ (Admitted patients Hospitalised[F,Otherfx]*(% private in public hospital hospitalised patients/100))*Hospitalisation Other fx major complexity DRG 179a private in public[State])
hospitalized persons costs[F, Otherfx, OOP]	Admitted patients Hospitalised[F,Otherfx]*(1-(% private in public hospital hospitalised patients/100))*Hospitalisation Other fx major complexity DRG 179a[OOP]+ (Admitted patients Hospitalised[F,Otherfx]*(% private in public hospital hospitalised patients/100))*Hospitalisation Other fx major complexity DRG 179a private in public[OOP])
hospitalized persons costs[F, Hipfx, Federal]	(Admitted patients Hospitalised[F,Hipfx]*(1-(% private in public hospital hospitalised patients/100))*Hospitalisation Hip fx major complexity unit cost - DRG 103a[Federal])+ (Admitted patients Hospitalised[F,Hipfx]*(% private in public hospital hospitalised patients/100))*Hospitalisation Hip fx major complexity unit cost - DRG 103a private in public[Federal])
hospitalized persons costs[F, Hipfx, State]	(Admitted patients Hospitalised[F,Hipfx]*(1-(% private in public hospital hospitalised patients/100))*Hospitalisation Hip fx major complexity unit cost - DRG 103a[State])+ (Admitted patients Hospitalised[F,Hipfx]*(% private in public hospital hospitalised patients/100))*Hospitalisation Hip fx major complexity unit cost - DRG 103a private in public[State])
hospitalized persons costs[F, Hipfx, OOP]	(Admitted patients Hospitalised[F,Hipfx]*(1-(% private in public hospital hospitalised patients/100))*Hospitalisation Hip fx major complexity unit cost - DRG 103a[OOP])+ (Admitted patients Hospitalised[F,Hipfx]*(% private in public hospital hospitalised patients/100))*Hospitalisation Hip fx major complexity unit cost - DRG 103a private in public[OOP])
Inflation over time(t)	Inflation over time(t-dt)+ (changes in inflation)*dt
INIT Inflation over time	0.93
Inflation over time 1(t)	Inflation over time 1(t-dt)+ (changes in inflation 1)*dt
INIT Inflation over time 1	1
Informal community care unit cost per patient[M, Otherfx]	5479
Informal community care unit cost per patient[M, Hipfx]	11755
Informal community care unit cost per patient[F, Otherfx]	5242
Informal community care unit cost per patient[F, Hipfx]	6911
intervention cost	SUM(total intervention related expenditures by gender and payers)
intervention cost 2019 onward[Funding level]	IF TIME>=2019 THEN intervention cost ELSE 0
item 23 over study period[Gender, Funding level]	Annual Item 23 cost
meals on wheels per patient unit cost[Federal]	0
meals on wheels per patient unit cost[State]	0
meals on wheels per patient unit cost[OOP]	3011

Model Variable	Values
Medication maint pa[Gender]	In GP-managed osteoporosis meds treatment post fx+ On GP-managed osteoporosis meds post hip fx+ ppl in osteoporosis meds treatment
Medication pa concession unit cost[Federal]	470.5
Medication pa concession unit cost[State]	0
Medication pa concession unit cost[OOP]	39.94
Medication pa non-concession unit cost[Federal]	306.6
Medication pa non-concession unit cost[State]	0
Medication pa non-concession unit cost[OOP]	203.84
Medication pa safetynet unit cost[Federal]	510
Medication pa safetynet unit cost[State]	0
Medication pa safetynet unit cost[OOP]	0
npv discount rate %pa	0
NPV factor	Inflation over time 1
OGS per patient unit cost[Federal]	72.76{Bonehealthpathology(66695+ 66716+ 66833)}
OGS per patient unit cost[State]	(10.83*2){geriexam*2}
OGS per patient unit cost[OOP]	0
pathology medication-initiation unit cost- multiple items[Federal]	102.21
pathology medication-initiation unit cost- multiple items[State]	0
pathology medication-initiation unit cost- multiple items[OOP]	6.43
pathology medication-maintenance unit cost[Federal]	(11.60*2)+ (25.54*0.5)
pathology medication-maintenance unit cost[State]	0
pathology medication-maintenance unit cost[OOP]	3.54
patients initiating treatment pa[Gender]	hip fx ppl referred to GP from SFPP for maintenance+ ppl initiating meds post other fx pa+ ppl initiating osteoporosis meds pa+ ppl referred to GP from SFPP for maintenance+ ppl with GP initiated meds post hip fx pa+ ppl with Specialist initiated meds post hip fx pa+ ppl with Specialist initiated meds post other fx pa+ ppl with Specialist initiated meds pre fx
Post fx rehabilitation unit cost[Federal, Otherfx]	0
Post fx rehabilitation unit cost[Federal, Hipfx]	0
Post fx rehabilitation unit cost[State, Otherfx]	13923

Model Variable	Values
Post fx rehabilitation unit cost[State, Hipfx]	17892
Post fx rehabilitation unit cost[OOP, Otherfx]	0
Post fx rehabilitation unit cost[OOP, Hipfx]	0
RACF per patient unit cost[Federal]	14003
RACF per patient unit cost[State]	0
RACF per patient unit cost[OOP]	0
Restarting GP visits[Gender]	osteoporosis meds restart rate+ osteoporosis meds restart rate post hip fx+ osteoporosis meds restart rate post other fx
Short stay other fx unit cost - URG10[Federal]	0
Short stay other fx unit cost - URG10[State]	1701
Short stay other fx unit cost - URG10[OOP]	0
Shortstay persons cost[M, Otherfx, Federal]	Admitted patients on Short Stay[M,Otherfx]*Short stay other fx unit cost - URG10[Fed]
Shortstay persons cost[M, Otherfx, State]	Admitted patients on Short Stay[M,Otherfx]*Short stay other fx unit cost - URG10[Sta]
Shortstay persons cost[M, Otherfx, OOP]	Admitted patients on Short Stay[M,Otherfx]*Short stay other fx unit cost - URG10[OOP]
Shortstay persons cost[M, Hipfx, Federal]	0
Shortstay persons cost[M, Hipfx, State]	0
Shortstay persons cost[M, Hipfx, OOP]	0
Shortstay persons cost[F, Otherfx, Federal]	Admitted patients on Short Stay[F,Otherfx]*Short stay other fx unit cost - URG10[Fed]
Shortstay persons cost[F, Otherfx, State]	Admitted patients on Short Stay[F,Otherfx]*Short stay other fx unit cost - URG10[Sta]
Shortstay persons cost[F, Otherfx, OOP]	Admitted patients on Short Stay[F,Otherfx]*Short stay other fx unit cost - URG10[OOP]
Shortstay persons cost[F, Hipfx, Federal]	0
Shortstay persons cost[F, Hipfx, State]	0
Shortstay persons cost[F, Hipfx, OOP]	0
specialist cost over study period[Gender, Funding level]	Annual Item 110+ 116 cost
specialist initial visit unit cost - item 110[Federal]	130.18
specialist initial visit unit cost - item 110[State]	0
specialist initial visit unit cost - item 110[OOP]	23+ 16.87
specialist sub multiplier	0.75
specialist subsequent visit unit cost - item 116[Federal]	65.15

Model Variable	Values
specialist subsequent visit unit cost - item 116[State]	0
specialist subsequent visit unit cost - item 116[OOP]	11.50+ 16.87
specialist subsequent visits[Gender]	Total specialist initiations*specialist sub multiplier
total base expenditures by gender and payers[Gender, Funding level]	Annual Item 23 cost+ Annual Item 110+ 116 cost+ Annual pathology cost+ Annual medication cost+ Annual DXA cost+ Annual community XRAY for fx cost+ Annual Ambulance Cost+ Annual ED only hospital visit cost+ Annual short stay other fx cost+ Annual hospitalised other fx costs+ Annual hospitalised hip fx costs+ Annual Rehab costs+ Annual OGS cost+ Annual SFPP cost+ Annual community physio cost+ Annual community service cost+ Annual RAC admission cost
total ED only hospital visit cost	SUM(Annual ED only hospital visit cost)
total expenditure by funder 2019 onwards[Funding level]	IF TIME>=2019 THEN Annual total expenditure by payer[Funding level] ELSE 0
Total GP DXA referrals[Gender]	getting DXA referral+ getting DXA referral post fx rate+ getting early referral+ getting early referral with healthy BMD+ getting late referral post hip fx
Total GP for fx	SUM(present direct to GP post other fx rate[*])
Total GP visits pa[Gender]	(Total GP DXA referrals*GP visting multiplier)+ total ppl visiting GP post fx for management+ Restarting GP visits+ ((Medication maint pa)*2.4)+ (Total GP for fx*3)
total intervention related expenditures by gender and payers[Funding level]	NRIAP screening. Annual NRIAP total cost+ Vitamin D in RACF. Annual Vitamin D intervention expenditures+ Exercise vouchers. total exercise intervention costs per year+ E-decision support tool & GP Education. Annual total GP education and e-decision tool intervention cost+ Bone Health Media Campaign. Media campaign annual cost
Total medicated population pa[Gender]	In GP-managed osteoporosis meds treatment post fx+ On GP-managed osteoporosis meds post hip fx+ ppl in osteoporosis meds treatment
total ppl visiting GP post fx for management[Gender]	hip fx ppl referred for GP management+ ppl referred for GP management
Total specialist initiations[Gender]	Referral from GP to Specialist pre fx+ Direct referral to specialist hip fx+ Direct referral to specialist other fx+ Referral from GP to Specialist post hip fx+ Referral from GP to Specialist post other fx

Falls:	

% normal BMD in RAC[M]	1.48
% normal BMD in RAC[F]	1.65
% osteopenia in RAC[M]	1.84
% osteopenia in RAC[F]	3.38
% osteoporsis in RAC[M]	3.11

Model Variable	Values
% osteoporosis in RAC[F]	6.12
Falls in the community modifier	0
falls per 100 persons pa in community normal BMD[M]	40
falls per 100 persons pa in community normal BMD[F]	40
falls per 100 persons pa in community osteopenia[M]	42
falls per 100 persons pa in community osteopenia[F]	42
falls per 100 persons pa in community osteoporosis[M]	47
falls per 100 persons pa in community osteoporosis[F]	46
falls per 100 persons pa in RAC osteoporosis[M]	230
falls per 100 persons pa in RAC osteoporosis[F]	223
falls per 100 persons pa in RAC normal BMD[M]	260
falls per 100 persons pa in RAC normal BMD[F]	275
falls per 100 persons pa in RAC osteopenia[M]	253
falls per 100 persons pa in RAC osteopenia[F]	249
number of no PP osteopenia falls pa[Gender]	total annual falls in community osteopenia no PP+ total annual falls in RAC osteopenia no PP
number of normal BMD falls pa[Gender]	total annual falls in community healthy BMD+ total annual falls in RAC healthy BMD
number of PP osteopenic falls pa[Gender]	total annual falls in community osteopenia with pp+ total annual falls in RAC osteopenia with PP
number of treated osteoporosis falls per year[Gender]	total annual falls in RAC osteoporosis with meds+ total annual falls in community osteoporosis with meds
number of treated post hip fx falls[Gender]	total annual falls in ppl with sentinel hip fx in RAC with meds+ total annual falls in ppl with sentinel hip fx in community with meds
number of treated post other fx falls[Gender]	total annual falls in ppl with sentinel other fx in community with meds+ total annual falls in ppl with sentinel other fx in RAC with meds
number of untreated osteoporotic falls pa[Gender]	total annual falls in community osteoporosis no meds+ total annual falls in RAC osteoporosis no meds
number of untreated post hip fx falls[Gender]	total annual falls in ppl with sentinel hip fx in community without meds+ total annual falls in ppl with sentinel hip fx in RAC without med
number of untreated post other fx falls[Gender]	total annual falls in ppl with sentinel other fx in community without meds+ total annual falls in ppl with sentinel other fx in RAC without meds
ppl with normal bones in aged care[Gender]	ppl with normal bones by BMD*(% normal BMD in RAC/100)
ppl with normal bones in community[Gender]	ppl with normal bones by BMD*(1-(% normal BMD in RAC/100))

Model Variable	Values
ppl with osteopenia in community no pp[Gender]	ppl with osteopenia without PP*(1-(% osteopenia in RAC/100))
ppl with osteopenia in community with pp[Gender]	ppl with osteopenia (with PP)*(1-(% osteopenia in RAC/100))
ppl with osteopenia in RAC no pp[Gender]	ppl with osteopenia without PP*(% osteopenia in RAC/100)
ppl with osteopenia in RAC with PP[Gender]	ppl with osteopenia (with PP)*(% osteopenia in RAC/100)
ppl with osteoporosis in community no meds[Gender]	ppl with osteoporosis without meds*(1-(% osteporsis in RAC/100))
ppl with osteoporosis in community with meds[Gender]	ppl with osteoporosis (with meds)*(1-(% osteporsis in RAC/100))
ppl with osteoporosis in RAC no meds[Gender]	ppl with osteoporosis without meds*(% osteporsis in RAC/100)
ppl with osteoporosis in RAC with meds[Gender]	ppl with osteoporosis (with meds)*(% osteporsis in RAC/100)
ppl with sentinel hip fx in community with meds[Gender]	ppl with sentinel hip fx (with meds)*(1-(% osteporsis in RAC/100))
ppl with sentinel hip fx in community without meds[Gender]	ppl with sentinel hip fx (without meds)*(1-(% osteporsis in RAC/100))
ppl with sentinel hip fx in RAC with meds[Gender]	ppl with sentinel hip fx (with meds)*(% osteporsis in RAC/100)
ppl with sentinel other fx in community with meds[Gender]	ppl with sentinel other fx (with meds)*(1-(% osteporsis in RAC/100))
ppl with sentinel other fx in community without meds[Gender]	ppl with sentinel other fx (without meds)*(1-(% osteporsis in RAC/100))
ppl with sentinel other fx in RAC with meds[Gender]	ppl with sentinel other fx (with meds)*(% osteporsis in RAC/100)
ppl with sentinel other fx in RAC without meds[Gender]	ppl with sentinel other fx (without meds)*(% osteporsis in RAC/100)
ppl with sentinel hip fx in RAC without meds[Gender]	ppl with sentinel hip fx (without meds)*(% osteporsis in RAC/100)
total annual falls in community normal BMD[Gender]	IF Exercise vouchers.Voucher Off\On= 1 THEN Exercise vouchers.total annual falls in community Normal BMD voucher ELSE ppl with normal BMD in community*((falls per 100 persons pa in community normal BMD/100)+ (falls per 100 persons pa in community normal BMD*(Falls in the community modifier/100))/100)
total annual falls in community osteopenia no PP[Gender]	IF Exercise vouchers.Voucher Off\On= 1 THEN Exercise vouchers.total annual falls in community osteopenia no PP voucher ELSE ppl with osteopenia in community no PP*((falls per 100 persons pa in community osteopenia/100)+ (falls per 100 persons pa in community osteopenia*(Falls in the community modifier/100))/100)
total annual falls in community osteopenia with PP[Gender]	IF Exercise vouchers.Voucher Off\On= 1 THEN Exercise vouchers.total annual falls in community osteopenia with PP voucher ELSE ppl with osteopenia in community with PP*((falls per 100 persons pa in community osteopenia/100)+ (falls per 100 persons pa in community osteopenia*(Falls in the community modifier/100))/100)
total annual falls in community osteoporosis no meds[Gender]	IF Exercise vouchers.Voucher Off\On= 1 THEN Exercise vouchers.total annual falls in community osteoporosis no meds voucher ELSE ppl with osteoporosis in community no meds*((falls per 100 persons pa in community osteoporosis/100)+ (falls per 100 persons pa in community osteoporosis*(Falls in the community modifier/100))/100)

Model Variable	Values
total annual falls in community osteoporosis with meds[Gender]	IF Exercise vouchers.Voucher Off\On= 1 THEN Exercise vouchers.total annual falls in community osteoporosis with meds voucher ELSE ppl with osteoporosis in community with meds*((falls per 100 persons pa in community osteoporosis/100)+(falls per 100 persons pa in community osteoporosis*(Falls in the community modifier/100))/100)
total annual falls in ppl with sentinel hip fx in community with meds[Gender]	IF Exercise vouchers.Voucher Off\On=1 THEN Exercise vouchers.total annual falls in community sentinel hip with meds voucher ELSE ppl with sentinel hip fx in community with meds*((falls per 100 persons pa in community osteoporosis/100)+(falls per 100 persons pa in community osteoporosis*(Falls in the community modifier/100))/100)
total annual falls in ppl with sentinel hip fx in community without meds[Gender]	IF Exercise vouchers.Voucher Off\On= 1 THEN Exercise vouchers.total annual falls in community sentinel hip no meds voucher ELSE ppl with sentinel hip fx in community without meds*((falls per 100 persons pa in community osteoporosis/100)+ (falls per 100 persons pa in community osteoporosis*(Falls in the community modifier/100))/100)
total annual falls in ppl with sentinel hip fx in RAC with meds[Gender]	(ppl with sentinel hip fx in RAC with meds*((falls per 100 persons pa in RAC osteoporosis/100)*(1-(Vitamin D in RACF.% coverage RAC Vitamin D/100))))+ (ppl with sentinel hip fx in RAC with meds*((falls per 100 persons pa in RAC osteoporosis/100)+ (falls per 100 persons pa in RAC osteoporosis*(Vitamin D in RACF.RAC vitamin D fall rate modifier/100))/100)*(Vitamin D in RACF.% coverage RAC Vitamin D/100))
total annual falls in ppl with sentinel hip fx in RAC without med[Gender]	(ppl with sentinel hip fx in RAC without meds*((falls per 100 persons pa in RAC osteoporosis/100)*(1-(Vitamin D in RACF.% coverage RAC Vitamin D/100))))+ (ppl with sentinel hip fx in RAC without meds*((falls per 100 persons pa in RAC osteoporosis/100)+ (falls per 100 persons pa in RAC osteoporosis*(Vitamin D in RACF.RAC vitamin D fall rate modifier/100))/100)*(Vitamin D in RACF.% coverage RAC Vitamin D/100))
total annual falls in ppl with sentinel other fx in community with meds[Gender]	IF Exercise vouchers.Voucher Off\On 1 THEN Exercise vouchers.total annual falls in community sentinel other with meds voucher ELSE ppl with sentinel other fx in community with meds*((falls per 100 persons pa in community osteoporosis/100)+ (falls per 100 persons pa in community osteoporosis*(Falls in the community modifier/100))/100)
total annual falls in ppl with sentinel other fx in community without meds[Gender]	IF Exercise vouchers.Voucher Off\On= 1 THEN Exercise vouchers.total annual falls in community sentinel other no meds voucher ELSE ppl with sentinel other fx in community without meds*((falls per 100 persons pa in community osteoporosis/100)+ (falls per 100 persons pa in community osteoporosis*(Falls in the community modifier/100))/100)
total annual falls in ppl with sentinel other fx in RAC with meds[Gender]	(ppl with sentinel other fx in RAC with meds*((falls per 100 persons pa in RAC osteoporosis/100)*(1-(Vitamin D in RACF.% coverage RAC Vitamin D/100))))+ (ppl with sentinel other fx in RAC with meds*((falls per 100 persons pa in RAC osteoporosis/100)+ (falls per 100 persons pa in RAC osteoporosis*(Vitamin D in RACF.RAC vitamin D fall rate modifier/100))/100)*(Vitamin D in RACF.% coverage RAC Vitamin D/100))
total annual falls in ppl with sentinel other fx in RAC without meds[Gender]	(ppl with sentinel other fx in RAC without meds*((falls per 100 persons pa in RAC osteoporosis/100)*(1-(Vitamin D in RACF.% coverage RAC Vitamin D/100))))+ (ppl with sentinel other fx in RAC without meds*((falls per 100 persons pa in RAC osteoporosis/100)+ (falls per 100 persons pa in RAC osteoporosis*(Vitamin D in RACF.RAC vitamin D fall rate modifier/100))/100)*(Vitamin D in RACF.% coverage RAC Vitamin D/100))
total annual falls in RAC normal BMD[Gender]	(ppl with normal BMD in aged care*((falls per 100 persons pa in RAG normal BMD/100)*(1-(Vitamin D in RACF.% coverage RAC Vitamin D/100))))+ (ppl with normal BMD in aged care*((falls per 100 persons pa in RAG normal BMD/100)+ (falls per 100 persons pa in RAG normal BMD*(Vitamin D in RACF.RAC vitamin D fall rate modifier/100))/100)*(Vitamin D in RACF.% coverage RAC Vitamin D/100))

Model Variable	Values
total annual falls in RAC osteopenia no PP[Gender]	$(\text{ppl with osteopenia in RAC no pp} * ((\text{falls per 100 persons pa in RAG osteopenia}/100) * (1 - (\text{Vitamin D in RACF.}\% \text{ coverage RAC Vitamin D}/100)))) + (\text{ppl with osteopenia in RAC no PP} * ((\text{falls per 100 persons pa in RAG osteopenia}/100) + (\text{falls per 100 persons pa in RAG osteopenia} * (\text{Vitamin D in RACF.RAC vitamin D fall rate modifier}/100))/100) * (\text{Vitamin D in RACF.}\% \text{ coverage RAC Vitamin D}/100))$
total annual falls in RAC osteopenia with PP[Gender]	$(\text{ppl with osteopenia in RAC with PP} * ((\text{falls per 100 persons pa in RAG osteopenia}/100) * (1 - (\text{Vitamin D in RACF.}\% \text{ coverage RAC Vitamin D}/100)))) + (\text{ppl with osteopenia in RAC with PP} * ((\text{falls per 100 persons pa in RAG osteopenia}/100) + (\text{falls per 100 persons pa in RAG osteopenia} * (\text{Vitamin D in RACF.RAC vitamin D fall rate modifier}/100))/100) * (\text{Vitamin D in RACF.}\% \text{ coverage RAC Vitamin D}/100))$
total annual falls in RAC osteoporosis no meds[Gender]	$(\text{ppl with osteoporosis in RAC no meds} * ((\text{falls per 100 persons pa in RAC osteoporosis}/100) * (1 - (\text{Vitamin D in RACF.}\% \text{ coverage RAC Vitamin D}/100)))) + (\text{ppl with osteoporosis in RAC no meds} * ((\text{falls per 100 persons pa in RAC osteoporosis}/100) + (\text{falls per 100 persons pa in RAC osteoporosis} * (\text{Vitamin D in RACF.RAC vitamin D fall rate modifier}/100))/100) * (\text{Vitamin D in RACF.}\% \text{ coverage RAC Vitamin D}/100))$
total annual falls in RAC osteoporosis with meds[Gender]	$(\text{ppl with osteoporosis in RAC with meds} * ((\text{falls per 100 persons pa in RAC osteoporosis}/100) * (1 - (\text{Vitamin D in RACF.}\% \text{ coverage RAC Vitamin D}/100)))) + (\text{ppl with osteoporosis in RAC with meds} * ((\text{falls per 100 persons pa in RAC osteoporosis}/100) + (\text{falls per 100 persons pa in RAC osteoporosis} * (\text{Vitamin D in RACF.RAC vitamin D fall rate modifier}/100))/100) * (\text{Vitamin D in RACF.}\% \text{ coverage RAC Vitamin D}/100))$

Fx Status Sector:	

medicated first hip fx fx-related death rate[Gender]	$((\text{hip fx-related death rate modifier} * \text{population death rate 70 plus})/1000) * \text{ppl with sentinel hip fx (with meds)}$
medicated other fx fx-related death rate[Gender]	$((\text{population death rate 65 plus} * \text{other fx-related death rate modifier}) * \text{ppl with sentinel other fx (with meds)})/1000$
other fx to hip fx rate (with meds)[Gender]	number of medicated first hip fx from other
other fx to hip fx rate (without meds)[Gender]	number of unmedicated first hip fx from other fx
post hip fx medication dropout rate[Gender]	post hip fx meds drop out+ osteoporosis meds lapsing rate post hip fx
post hip fx medication uptake rate[Gender]	ppl with GP initiated meds post hip fx pa+ hip fx ppl referred to GP from SFPP for maintenance+ osteoporosis meds restart rate post hip fx+ ppl with Specialist initiated meds post hip fx pa
post-sentinel fx medication dropout rate[Gender]	osteoporosis meds lapsing rate post other fx+ post fx meds drop out
post-sentinel fx medication uptake rate[Gender]	osteoporosis meds restart rate post other fx+ ppl referred to GP from SFPP for maintenance+ ppl initiating meds post other fx pa+ ppl with Specialist initiated meds post other fx pa
ppl with second MT hip fx[M](t)	$\text{ppl with second MT hip fx}[M](t-dt) + (\text{second hip fx rate (without meds)}[M] + \text{second hip fx rate (with meds)}[M]) - \text{second hip fx death rate}[M] * dt$
INIT ppl with second MT hip fx[M]	Population 50 Plus*0.003

Model Variable	Values
ppl with second MT hip fx[F](t)	ppl with second MT hip fx[F](t-dt)+ (second hip fx rate (without meds)[F]+ second hip fx rate (with meds)[F]-second hip fx death rate[F])*dt
INIT ppl with second MT hip fx[F]	Population 50 Plus*0.007
ppl with sentinel hip fx (with meds)[M](t)	ppl with sentinel hip fx (with meds)[M](t-dt)+ (other fx to hip fx rate (with meds)[M]+ post hip fx medication uptake rate[M]+ Sentinel hip fx rate with meds[M]-medicated first hip fx fx-related death rate[M]-post hip fx medication dropout rate[M]-second hip fx rate (with meds)[M])*dt
INIT "ppl with sentinel hip fx (with meds)"[M]	Population 50 Plus*0.0055
ppl with sentinel hip fx (with meds)[F](t)	ppl with sentinel hip fx (with meds)[F](t-dt)+ (other fx to hip fx rate (with meds)[F]+ post hip fx medication uptake rate[F]+ Sentinel hip fx rate with meds[F]-medicated first hip fx fx-related death rate[F]-post hip fx medication dropout rate[F]-second hip fx rate (with meds)[F])*dt
INIT "ppl with sentinel hip fx (with meds)"[F]	Population 50 Plus*0.0337
ppl with sentinel hip fx (without meds)[M](t)	ppl with sentinel hip fx (without meds)[M](t-dt)+ (other fx to hip fx rate (without meds)[M]+ post hip fx medication dropout rate[M]+ Sentinel hip fx rate without meds[M]-second hip fx rate (without meds)[M]-unmedicated first hip fx fx-related death rate[M]-post hip fx medication uptake rate[M])*dt
INIT "ppl with sentinel hip fx (without meds)"[M]	Population 50 Plus*0.0515
ppl with sentinel hip fx (without meds)[F](t)	ppl with sentinel hip fx (without meds)[F](t-dt)+ (other fx to hip fx rate (without meds)[F]+ post hip fx medication dropout rate[F]+ Sentinel hip fx rate without meds[F]-second hip fx rate (without meds)[F]-unmedicated first hip fx fx-related death rate[F]-post hip fx medication uptake rate[F])*dt
INIT "ppl with sentinel hip fx (without meds)"[F]	Population 50 Plus*0.0993
ppl with sentinel other fx (with meds)[M](t)	ppl with sentinel other fx (with meds)[M](t-dt)+ (post-sentinel fx medication uptake rate[M]+ sentinel other fx rate (with meds)[M]-other fx to hip fx rate (with meds)[M]-medicated other fx fx-related death rate[M]-post-sentinel fx medication dropout rate[M])*dt
INIT "ppl with sentinel other fx (with meds)"[M]	Population 50 Plus*0.0118
ppl with sentinel other fx (with meds)[F](t)	ppl with sentinel other fx (with meds)[F](t-dt)+ (post-sentinel fx medication uptake rate[F]+ sentinel other fx rate (with meds)[F]-other fx to hip fx rate (with meds)[F]-medicated other fx fx-related death rate[F]-post-sentinel fx medication dropout rate[F])*dt
INIT "ppl with sentinel other fx (with meds)"[F]	Population 50 Plus*0.0289
ppl with sentinel other fx (without meds)[M](t)	ppl with sentinel other fx (without meds)[M](t-dt)+ (post-sentinel fx medication dropout rate[M]+ sentinel other fx rate (without meds)[M]-other fx to hip fx rate (without meds)[M]-unmedicated other fx related death rate[M]-post-sentinel fx medication uptake rate[M])*dt
INIT "ppl with sentinel other fx (without meds)"[M]	Population 50 Plus*0.1782
ppl with sentinel other fx (without meds)[F](t)	ppl with sentinel other fx (without meds)[F](t-dt)+ (post-sentinel fx medication dropout rate[F]+ sentinel other fx rate (without meds)[F]-other fx to hip fx rate (without meds)[F]-unmedicated other fx related death rate[F]-post-sentinel fx medication uptake rate[F])*dt

Model Variable	Values
INIT "ppl with sentinel other fx (without meds)"[F]	Population 50 Plus*0.2311
second hip fx death rate[Gender]	ppl with second MT hip fx*((population death rate 75 plus/1000)*hip fx-related death rate modifier)
second hip fx rate (with meds)[Gender]	number of medicated second hip fx
second hip fx rate (without meds)[Gender]	number of unmedicated second hip fx
Sentinel hip fx rate with meds[Gender]	osteoporosis with medication first hip fx rate
Sentinel hip fx rate without meds[Gender]	osteopenia without PP first hip fx rate+ normal BMD hip fx rate+ treated osteopenia first hip fx rate+ osteoporosis without meds first hip fx rate
sentinel other fx rate (with meds)[Gender]	osteoporosis with medication first other fx rate
sentinel other fx rate (without meds)[Gender]	normal BMD other fx rate+ treated osteopenia first other fx rate+ untreated osteoporosis first other fx rate+ osteopenia without PP other fx rate
unmedicated first hip fx fx-related death rate[Gender]	((hip fx-related death rate modifier*population death rate 70 plus)/1000)*ppl with sentinel hip fx (without meds)
unmedicated other fx related death rate[Gender]	((population death rate 65 plus*other fx-related death rate modifier)/1000)*ppl with sentinel other fx (without meds)

Hospital Care:	

% inpatient med initiation hip fx[M]	17
% inpatient med initiation hip fx[F]	17
% of OGS patients who got DXA[M]	23.3
% of OGS patients who got DXA[F]	23.3
% of patients inpatients+referred screened	((FLS Expansion.Total available FLS units/FLS Expansion.total final FLS units)*100)*0.5
% of vert fx admitted to hospital[M]	50
% of vert fx admitted to hospital[F]	50
% pa ED referral to post fx management[M]	10
% pa ED referral to post fx management[F]	10
% pa inpatient referral to post fx management[M]	25
% pa inpatient referral to post fx management[F]	25
% patients who get DXA in FLS[M]	100
% patients who get DXA in FLS[F]	100

Model Variable	Values
% patients who initiate medication FLS[M]	66.6
% patients who initiate medication FLS[F]	66.6
% patients who initiate medication in OGS[M]	43.6
% patients who initiate medication in OGS[F]	43.6
% screened for FLS	20
% vert fx who present to hospital[M]	10
% vert fx who present to hospital[F]	10
ED	SUM(People in ED[*,*,*])
Flow 42[Gender, FxT]	(Post fx management*% of patients inpatients+ referred screened)*(% screened for FLS/100)*(1-(%do nothing preference[Gender]/100))
FLS patients who got DXA[Gender]	SUM(ppl referred to FLS for management[Gender,*])*(% patients who get DXA in FLS/100)
FLS scoped in[Gender, FxT]	((SUM(no referral or management post ED[Gender,* ,FxT])+ SUM(no referral or management post inpatient[Gender,* ,FxT]))*% of patients inpatients+ referred screened)*(% screened for FLS/100)*(1-(%do nothing preference[Gender]/100))
fx to ED and hospital[M, yes, Otherfx]	(total vert fx who report to hospital[M,yes]*(% of vert fx admitted to hospital[M]/100))+ (total non vert other fx who report to hospital[M,yes]*(% of non-vert other fx admitted to hospital[M]/100))
fx to ED and hospital[M, yes, Hipfx]	total number of first hip fx with meds pa[M]+ second hip fx rate (with meds)[M]
fx to ED and hospital[M, no, Otherfx]	(total vert fx who report to hospital[M,no]*(% of vert fx admitted to hospital[M]/100))+ (total non-vert other fx who report to hospital[M,no]*(% of non-vert other fx admitted to hospital[M]/100))
fx to ED and hospital[M, no, Hipfx]	total number of first hip fx without meds pa[M]+ second hip fx rate (without meds)[M]
fx to ED and hospital[F, yes, Otherfx]	(total vert fx who report to hospital[F,yes]*(% of vert fx admitted to hospital[F]/100))+ (total non vert other fx who report to hospital[F,yes]*(% of non-vert other fx admitted to hospital[F]/100))
fx to ED and hospital[F, yes, Hipfx]	total number of first hip fx with meds pa[F]+ second hip fx rate (with meds)[F]
fx to ED and hospital[F, no, Otherfx]	(total vert fx who report to hospital[F,no]*(% of vert fx admitted to hospital[F]/100))+ (total non vert other fx who report to hospital[F,no]*(% of non-vert other fx admitted to hospital[F]/100))
fx to ED and hospital[F, no, Hipfx]	total number of first hip fx without meds pa[F]+ second hip fx rate (without meds)[F]
fx to just ED[M, yes, Otherfx]	(total vert fx who report to hospital[M,yes]*(1-(% of vert fx admitted to hospital[M]/100)))+(total non vert other fx who report to hospital[M,yes]*(1-(% of non-vert other fx admitted to hospital[M]/100)))
fx to just ED[M, yes, Hipfx]	0
fx to just ED[M, no, Otherfx]	(total vert fx who report to hospital[M,no]*(1-(% of vert fx admitted to hospital[M]/100)))+(total non vert other fx who report to hospital[M,no]*(1-(% of non-vert other fx admitted to hospital[M]/100)))
fx to just ED[M, no, Hipfx]	0

Model Variable	Values
fx to just ED[F, yes, Otherfx]	(total vert fx who report to hospital[F,yes]*(1-(% of vert fx admitted to hospital[F]/100)))+(total non vert other fx who report to hospital[F,yes]*(1-(% of non-vert other fx admitted to hospital[F]/100)))
fx to just ED[F, yes, Hipfx]	0
fx to just ED[F, no, Otherfx]	(total vert fx who report to hospital[F,no]*(1-(% of vert fx admitted to hospital[F]/100)))+(total non vert other fx who report to hospital[F,no]*(1-(% of non-vert other fx admitted to hospital[F]/100)))
fx to just ED[F, no, Hipfx]	0
GP noshow[Gender, FxT]	LEAKAGEOUTFLOW
LEAKAGE FRACTION	%do nothing preference[Gender]/100
GP referral[Gender, FxT]	Post fx management*(1-(specialist direct referral rate[Gender]/100))
Hospitalisation	SUM(People admitted to hospital[*,*,*])
Inpatient hip fx initiating meds in hospital[M, yes, Otherfx]	0
Inpatient hip fx initiating meds in hospital[M, yes, Hipfx]	0
Inpatient hip fx initiating meds in hospital[M, no, Otherfx]	0
Inpatient hip fx initiating meds in hospital[M, no, Hipfx]	People admitted to hospital[M,no,Hipfx]*(% inpatient med initiation hip fx[M]/100)
Inpatient hip fx initiating meds in hospital[F, yes, Otherfx]	0
Inpatient hip fx initiating meds in hospital[F, yes, Hipfx]	0
Inpatient hip fx initiating meds in hospital[F, no, Otherfx]	0
Inpatient hip fx initiating meds in hospital[F, no, Hipfx]	People admitted to hospital[F,no,Hipfx]*(% inpatient med initiation hip fx[F]/100)
new patients that can be seen by per month	11
no referral or management post ED[M, yes, Otherfx]	People in ED[M,yes,Otherfx]*(1-(% pa ED referral to post fx management[M]/100))
no referral or management post ED[M, yes, Hipfx]	0
no referral or management post ED[M, no, Otherfx]	People in ED[M,no,Otherfx]*(1-(% pa ED referral to post fx management[M]/100))
no referral or management post ED[M, no, Hipfx]	0
no referral or management post ED[F, yes, Otherfx]	People in ED[F,yes,Otherfx]*(1-(% pa ED referral to post fx management[F]/100))
no referral or management post ED[F, yes, Hipfx]	0

Model Variable	Values
no referral or management post ED[F, no, Otherfx]	People in ED[F,no,Otherfx]*(1-(% pa ED referral to post fx management[F]/100))
no referral or management post ED[F, no, Hipfx]	0
no referral or management post inpatient[M, yes, Otherfx]	People admitted to hospital[M,yes,Otherfx]*(1-(% pa inpatient referral to post fx management[M]/100))
no referral or management post inpatient[M, yes, Hipfx]	(People admitted to hospital[M,yes,Hipfx]-ppl with hip fx referred to OGS[M,yes,Hipfx]-Inpatient hip fx initiating meds in hospital[M,yes,Hipfx])*(1-(% pa inpatient referral to post fx management[M]/100))
no referral or management post inpatient[M, no, Otherfx]	People admitted to hospital[M,no,Otherfx]*(1-(% pa inpatient referral to post fx management[M]/100))
no referral or management post inpatient[M, no, Hipfx]	(People admitted to hospital[M,no,Hipfx]-ppl with hip fx referred to OGS[M,no,Hipfx]-Inpatient hip fx initiating meds in hospital[M,no,Hipfx])*(1-(% pa inpatient referral to post fx management[M]/100))
no referral or management post inpatient[F, yes, Otherfx]	People admitted to hospital[F,yes,Otherfx]*(1-(% pa inpatient referral to post fx management[F]/100))
no referral or management post inpatient[F, yes, Hipfx]	(People admitted to hospital[F,yes,Hipfx]-ppl with hip fx referred to OGS[F,yes,Hipfx]-Inpatient hip fx initiating meds in hospital[F,yes,Hipfx])*(1-(% pa inpatient referral to post fx management[F]/100))
no referral or management post inpatient[F, no, Otherfx]	People admitted to hospital[F,no,Otherfx]*(1-(% pa inpatient referral to post fx management[F]/100))
no referral or management post inpatient[F, no, Hipfx]	(People admitted to hospital[F,no,Hipfx]-ppl with hip fx referred to OGS[F,no,Hipfx]-Inpatient hip fx initiating meds in hospital[F,no,Hipfx])*(1-(% pa inpatient referral to post fx management[F]/100))
Number of hospitals with OGS services	58
OGS capacity	Number of hospitals with OGS services*new patients that can be seen by per month
patients who got DXA pa[Gender]	SUM(ppl with hip fx referred to OGS[Gender,*,*])*(% of OGS patients who got DXA/100)
People admitted to hospital[Gender, Prevention, FxT](t)	People admitted to hospital[Gender,Prevention,FxT](t-dt)+ (fx to ED and hospital[Gender,Prevention,FxT]-ppl with hip fx referred to OGS[Gender,Prevention,FxT]-Inpatient hip fx initiating meds in hospital[Gender,Prevention,FxT]-to post fx management from inpatient[Gender,Prevention,FxT]-no referral or management post inpatient[Gender,Prevention,FxT])*dt
INIT People admitted to hospital[Gender, Prevention, FxT]	fx to ED and hospital
people going to GP for management[Gender, FxT]	CONVEYOROUTFLOW
People in ED[Gender, Prevention, FxT](t)	People in ED[Gender,Prevention,FxT](t-dt)+ (fx to just ED[Gender,Prevention,FxT]-no referral or management post ED[Gender,Prevention,FxT]-to post fx management from ED[Gender,Prevention,FxT])*dt
INIT People in ED[Gender, Prevention, FxT]	fx to just ED
People referred for DXA by specialist[Gender]	SUM(ppl referred to specialist for management[Gender,*])*(Specialist DXA referral rate/100)

Model Variable	Values
Post fx management[Gender, FxT](t)	Post fx management[Gender,FxT](t-dt)+ (to post fx management from inpatient[Gender,Prevention,FxT]+ to post fx management from ED[Gender,Prevention,FxT]-Flow 42[Gender,FxT]-specialist referral[Gender,FxT]-GP referral[Gender,FxT])*dt
INIT Post fx management[Gender, FxT]	SUM(to post fx management from ED[Gender,*,FxT])+ SUM(to post fx management from inpatient[Gender,*,FxT])
Ppl exiting FLS already on meds[Gender, FxT]	LEAKAGEOUTFLOW
LEAKAGE FRACTION	% Post fx management previously medicated/100
ppl exiting FLS not on meds[Gender, FxT]	CONVEYOROUTFLOW
ppl exiting FLS on newly initiated meds[Gender, FxT]	LEAKAGEOUTFLOW
LEAKAGE FRACTION	% patients who initiate medication FLS[Gender]/100
ppl exiting OGS already on meds[Gender, FxT]	LEAKAGEOUTFLOW
LEAKAGE FRACTION	% Post fx management previously medicated/100
ppl exiting OGS not on meds[Gender, FxT]	CONVEYOROUTFLOW
ppl exiting OGS on new meds[Gender, FxT]	LEAKAGEOUTFLOW
LEAKAGE FRACTION	(% patients who initiate medication in OGS[Gender]/100)
ppl referred to FLS for management[Gender, FxT]	CONVEYOROUTFLOW
ppl referred to specialist for management[Gender, FxT]	CONVEYOROUTFLOW
PPL screened to FLS[M, Otherfx](t)	PPL screened to FLS[M,Otherfx](t-dt)+ (FLS scoped in[M,Otherfx]+ Flow 42[M,Otherfx]-ppl referred to FLS for management[M,Otherfx])*dt
INIT PPL screened to FLS[M, Otherfx]	365
TRANSIT TIME	DT
CAPACITY	SFPP capacity by gender*DT
INFLOW LIMIT	INF
PPL screened to FLS[M, Hipfx](t)	PPL screened to FLS[M,Hipfx](t-dt)+ (FLS scoped in[M,Hipfx]+ Flow 42[M,Hipfx]-ppl referred to FLS for management[M,Hipfx])*dt
INIT PPL screened to FLS[M, Hipfx]	40
TRANSIT TIME	DT
CAPACITY	SFPP capacity by gender*DT
INFLOW LIMIT	INF
PPL screened to FLS[F, Otherfx](t)	PPL screened to FLS[F,Otherfx](t-dt)+ (FLS scoped in[F,Otherfx]+ Flow 42[F,Otherfx]-ppl referred to FLS for management[F,Otherfx])*dt

Model Variable	Values
INIT PPL screened to FLS[F, Otherfx]	634
TRANSIT TIME	DT
CAPACITY	SFPP capacity by gender*DT
INFLOW LIMIT	INF
PPL screened to FLS[F, Hipfx](t)	PPL screened to FLS[F,Hipfx](t-dt)+ (FLS scoped in[F,Hipfx]+ Flow 42[F,Hipfx]-ppl referred to FLS for management[F,Hipfx])*dt
INIT PPL screened to FLS[F, Hipfx]	119
TRANSIT TIME	DT
CAPACITY	SFPP capacity by gender*DT
INFLOW LIMIT	INF
ppl under care of FLS[M, Otherfx](t)	ppl under care of FLS[M,Otherfx](t-dt)+ (ppl referred to FLS for management[M,Otherfx]-ppl exiting FLS not on meds[M,Otherfx]-Ppl exiting FLS already on meds[M,Otherfx]-ppl exiting FLS on newly initiated meds[M,Otherfx])*dt
INIT ppl under care of FLS[M, Otherfx]	ppl referred to FLS for management[M,Otherfx]*DT
TRANSIT TIME	DT
ppl under care of FLS[M, Hipfx](t)	ppl under care of FLS[M,Hipfx](t-dt)+ (ppl referred to FLS for management[M,Hipfx]-ppl exiting FLS not on meds[M,Hipfx]-Ppl exiting FLS already on meds[M,Hipfx]-ppl exiting FLS on newly initiated meds[M,Hipfx])*dt
INIT ppl under care of FLS[M, Hipfx]	ppl referred to FLS for management[M,Hipfx]*DT
TRANSIT TIME	DT
ppl under care of FLS[F, Otherfx](t)	ppl under care of FLS[F,Otherfx](t-dt)+ (ppl referred to FLS for management[F,Otherfx]-ppl exiting FLS not on meds[F,Otherfx]-Ppl exiting FLS already on meds[F,Otherfx]-ppl exiting FLS on newly initiated meds[F,Otherfx])*dt
INIT ppl under care of FLS[F, Otherfx]	ppl referred to FLS for management[F,Otherfx]*DT
TRANSIT TIME	DT
ppl under care of FLS[F, Hipfx](t)	ppl under care of FLS[F,Hipfx](t-dt)+ (ppl referred to FLS for management[F,Hipfx]-ppl exiting FLS not on meds[F,Hipfx]-Ppl exiting FLS already on meds[F,Hipfx]-ppl exiting FLS on newly initiated meds[F,Hipfx])*dt
INIT ppl under care of FLS[F, Hipfx]	ppl referred to FLS for management[F,Hipfx]*DT
TRANSIT TIME	DT
ppl under care of OGS[Gender, FxT](t)	ppl under care of OGS[Gender,FxT](t-dt)+ (ppl with hip fx referred to OGS[Gender,Prevention,FxT]-ppl exiting OGS not on meds[Gender,FxT]-ppl exiting OGS already on meds[Gender,FxT]-ppl exiting OGS on new meds[Gender,FxT])*dt
INIT ppl under care of OGS[Gender, FxT]	(SUM(ppl with hip fx referred to OGS[Gender,*,FxT]))*DT
TRANSIT TIME	DT
CAPACITY	INF

Model Variable	Values
INFLOW LIMIT	INF
PPL with direct specialist referral[Gender, FxT](t)	PPL with direct specialist referral[Gender,FxT](t-dt)+ (specialist referral[Gender,FxT]-ppl referred to specialist for management[Gender,FxT]-specialist no show[Gender,FxT])*dt
INIT PPL with direct specialist referral[Gender, FxT]	specialist referral*DT
TRANSIT TIME	DT
CAPACITY	INF
INFLOW LIMIT	INF
PPL with GP referral[Gender, FxT](t)	PPL with GP referral[Gender,FxT](t-dt)+ (GP referral[Gender,FxT]-people going to GP for management[Gender,FxT]-GP no show[Gender,FxT])*dt
INIT PPL with GP referral[Gender, FxT]	GP referral*DT
TRANSIT TIME	DT
CAPACITY	INF
INFLOW LIMIT	INF
ppl with hip fx referred to OGS[M, yes, Otherfx]	0
ppl with hip fx referred to OGS[M, yes, Hipfx]	OGS capacity*M/F y/n hip ratio[M,yes]
ppl with hip fx referred to OGS[M, no, Otherfx]	0
ppl with hip fx referred to OGS[M, no, Hipfx]	OGS capacity*M/F y/n hip ratio[M,no]
ppl with hip fx referred to OGS[F, yes, Otherfx]	0
ppl with hip fx referred to OGS[F, yes, Hipfx]	OGS capacity*M/F y/n hip ratio[F,yes]
ppl with hip fx referred to OGS[F, no, Otherfx]	0
ppl with hip fx referred to OGS[F, no, Hipfx]	OGS capacity*M/F y/n hip ratio[F,no]
SFPP capacity[M]	(FLS Expansion.Total available FLS units*new patients that can be seen by SFPP per month*12)*M/F management ratio
SFPP capacity[F]	(FLS Expansion.Total available FLS units*new patients that can be seen by SFPP per month*12)*(1-M/F management ratio)
SFPP capacity by gender[M, Otherfx]	SFPP capacity[M]*(1-(% pst fx management hip[M]/100))
SFPP capacity by gender[M, Hipfx]	SFPP capacity[M]*(% pst fx management hip[M]/100)
SFPP capacity by gender[F, Otherfx]	SFPP capacity[F]*(1-(% pst fx management hip[F]/100))
SFPP capacity by gender[F, Hipfx]	SFPP capacity[F]*(% pst fx management hip[F]/100)
specialist direct referral rate[M]	10
specialist direct referral rate[F]	10

Model Variable	Values
Specialist DXA referral rate[Gender]	probability of referral for DXA over 70 base figure*1.5
specialist no show[Gender, FxT]	LEAKAGEOUTFLOW
LEAKAGE FRACTION	%do nothing preference[Gender]/100
specialist referral[Gender, FxT]	Post fx management*(specialist direct referral rate[Gender]/100)
to post fx management from ED[M, yes, Otherfx]	People in ED[M,yes,Otherfx]*(% pa ED referral to post fx management[M]/100)
to post fx management from ED[M, yes, Hipfx]	0
to post fx management from ED[M, no, Otherfx]	People in ED[M,no,Otherfx]*(% pa ED referral to post fx management[M]/100)
to post fx management from ED[M, no, Hipfx]	0
to post fx management from ED[F, yes, Otherfx]	People in ED[F,yes,Otherfx]*(% pa ED referral to post fx management[F]/100)
to post fx management from ED[F, yes, Hipfx]	0
to post fx management from ED[F, no, Otherfx]	People in ED[F,no,Otherfx]*(% pa ED referral to post fx management[F]/100)
to post fx management from ED[F, no, Hipfx]	0
to post fx management from inpatient[M, yes, Otherfx]	People admitted to hospital[M,yes,Otherfx]*(% pa inpatient referral to post fx management[M]/100)
to post fx management from inpatient[M, yes, Hipfx]	(People admitted to hospital[M,yes,Hipfx]-ppl with hip fx referred to OGS[M,yes,Hipfx]-Inpatient hip fx initiating meds in hospital[M,yes,Hipfx])*((% pa inpatient referral to post fx management[M]/100))
to post fx management from inpatient[M, no, Otherfx]	People admitted to hospital[M,no,Otherfx]*(% pa inpatient referral to post fx management[M]/100)
to post fx management from inpatient[M, no, Hipfx]	(People admitted to hospital[M,no,Hipfx]-ppl with hip fx referred to OGS[M,no,Hipfx]-Inpatient hip fx initiating meds in hospital[M,no,Hipfx])*((% pa inpatient referral to post fx management[M]/100))
to post fx management from inpatient[F, yes, Otherfx]	People admitted to hospital[F,yes,Otherfx]*(% pa inpatient referral to post fx management[F]/100)
to post fx management from inpatient[F, yes, Hipfx]	(People admitted to hospital[F,yes,Hipfx]-ppl with hip fx referred to OGS[F,yes,Hipfx]-Inpatient hip fx initiating meds in hospital[F,yes,Hipfx])*((% pa inpatient referral to post fx management[F]/100))
to post fx management from inpatient[F, no, Otherfx]	People admitted to hospital[F,no,Otherfx]*(% pa inpatient referral to post fx management[F]/100)
to post fx management from inpatient[F, no, Hipfx]	(People admitted to hospital[F,no,Hipfx]-ppl with hip fx referred to OGS[F,no,Hipfx]-Inpatient hip fx initiating meds in hospital[F,no,Hipfx])*((% pa inpatient referral to post fx management[F]/100))
total non vert other fx who report to hospital[M, yes]	number of non vert other fx with meds pa[M]*(% of other fx that report to hospital[M]/100)
total non vert other fx who report to hospital[M, no]	number of non vert other fx without meds pa[M]*(% of other fx that report to hospital[M]/100)
total non vert other fx who report to hospital[F, yes]	number of non vert other fx with meds pa[F]*(% of other fx that report to hospital[F]/100)
total non vert other fx who report to hospital[F, no]	number of non vert other fx without meds pa[F]*(% of other fx that report to hospital[F]/100)
total number of first hip fx with meds pa[Gender]	osteoporosis with medication first hip fx rate+ other fx to hip fx rate (with meds)

Model Variable	Values
total number of first hip fx without meds pa[Gender]	osteopenia without PP first hip fx rate+ osteoporosis without meds first hip fx rate+ treated osteopenia first hip fx rate+ other fx to hip fx rate (without meds)+ second hip fx rate (without meds)
total vert fx who report to hospital[M, yes]	total vert fx pa with meds[M]*(% vert fx who present to hospital[M]/100)
total vert fx who report to hospital[M, no]	total vert fx pa without meds[M]*(% vert fx who present to hospital[M]/100)
total vert fx who report to hospital[F, yes]	total vert fx pa with meds[F]*(% vert fx who present to hospital[F]/100)
total vert fx who report to hospital[F, no]	total vert fx pa without meds[F]*(% vert fx who present to hospital[F]/100)

Intervention sector:	

baseline number of FLS units	29
ppl in aged care[Gender]	ppl with normal bones in aged care+ ppl with osteopenia in RAC no pp+ ppl with osteopenia in RAC with PP+ ppl with osteoporosis in RAC no meds+ ppl with osteoporosis in RAC with meds+ ppl with sentinel hip fx in RAC with meds+ ppl with sentinel other fx in RAC with meds+ ppl with sentinel other fx in RAC without meds+ ppl with sentinel hip fx in RAC without meds

Pre-fx Bone Health status:	

% of ppl having impaired bone health in lifetime[M]	62
% of ppl having impaired bone health in lifetime[F]	71
% osteopenia become osteoporotic[M]	9.7
% osteopenia become osteoporotic[F]	32
Mean age of osteopenia onset[M]	58
Mean age of osteopenia onset[F]	58
Mean age osteoporosis onset[M]	70
Mean age osteoporosis onset[F]	70
Mean years living with ostopenia with PP[Gender]	Mean age osteoporosis onset-Mean age of osteopenia onset
Mean years living with untreated ostopenia[Gender]	Mean age osteoporosis onset-Mean age of osteopenia onset
normal BMD death rate[Gender]	ppl with normal BMD/1000*(Death Rate per 1000 50plus-Healthy people death rate reduction)
Healthy osteopenia death modifier[M]	0.7
Healthy osteopenia death modifier[F]	0.4

Model Variable	Values
Healthy people death rate reduction[M]	11
Healthy people death rate reduction[F]	14
Healthy osteoporosis death modifier[M]	0.8
Healthy osteoporosis death modifier[F]	0.4
normal BMD hip fx rate[Gender]	number of normal BMD sentinel hip fx pa
normal BMD other fx rate[Gender]	number of normal BMD first OTHER fx pa
osteopenia PP dropout rate[Gender]	osteopenia PP lapsing rate+ osteopenia treatment dropping out pa
osteopenia PP uptake rate[Gender]	people initiating early PP pa+ osteopenia PP restart rate
osteopenia with PP death rate[Gender]	(population death rate 60 plus*ppl with osteopenia (with PP))/1000*Healthy osteopenia death modifier
osteopenia without meds death rate[Gender]	(population death rate 60 plus*ppl with osteopenia without PP)/1000*Healthy osteopenia death modifier
osteopenia without PP first hip fx rate[Gender]	number of osteopenic first hip fx (no PP) pa
osteopenia without PP other fx rate[Gender]	number of osteopenic sentinel OTHER fx (no PP) pa
osteoporosis meds dropout rate[Gender]	osteoporosis meds drop out+ osteoporosis meds lapsing rate
osteoporosis meds uptake rate[Gender]	ppl initiating osteoporosis meds pa+ osteoporosis meds restart rate+ ppl with Specialist initiated meds pre fx
osteoporosis with medication first hip fx rate[Gender]	number of osteoporotic first hip fx (with meds) pa
osteoporosis with medication first other fx rate[Gender]	number of osteoporotic OTHER first fx (with meds) pa
osteoporosis with meds death rate[Gender]	(population death rate 65 plus*ppl with osteoporosis (with meds))/1000*Healthy osteoporosis death modifier
osteoporosis without meds death rate[Gender]	(population death rate 65 plus*ppl with osteoporosis without meds)/1000*Healthy osteoporosis death modifier
osteoporosis without meds first hip fx rate[Gender]	number of osteoporotic sentinel hip fx (no meds)pa
ppl developing impaired bone health rate[Gender]	(% of ppl having impaired bone health in 1 IF etime*(ppl with normal bones by BMD/100))/(Mean age of osteopenia onset-50)
ppl developing osteoporosis rate[Gender]	(ppl with osteopenia without PP*(% osteopenia become osteoporotic/100))/Mean years living with untreated ostopenia
ppl developing osteoporosis with PP rate[Gender]	(ppl with osteopenia (with PP)*(% osteopenia become osteoporotic/100))/Mean years living with ostopenia with PP
ppl with normal bones by BMD[M](t)	ppl with normal bones by BMD[M](t-dt)+ (tuning 50 rate[M]-healthy BMD death rate[M]-ppl developing impaired bone health rate[M]-normal BMD other fx rate[M]-normal BMD hip fx rate[M])*dt
INIT ppl with normal bones by BMD[M]	Population 50 Plus*0.29
ppl with normal bones by BMD[F](t)	ppl with normal BMD[F](t-dt)+ (tuning 50 rate[F]-healthy BMD death rate[F]-ppl developing impaired bone health rate[F]-normal BMD other fx rate[F]-normal BMD hip fx rate[F])*dt
INIT ppl with normal bones by BMD[F]	Population 50 Plus*0.1807

Model Variable	Values
ppl with osteopenia (with PP)[M](t)	ppl with osteopenia (with PP)[M](t-dt)+ (osteopenia PP uptake rate[M]-ppl developing osteoporosis with PP rate[M]-osteopenia with PP death rate[M]-osteopenia PP dropout rate[M]-treated osteopenia first other fx rate[M]-treated osteopenia first hip fx rate[M])*dt
INIT "ppl with osteopenia (with PP)"[M]	(Population 50 Plus*0.418)*0.1
ppl with osteopenia (with PP)[F](t)	ppl with osteopenia (with PP)[F](t-dt)+ (osteopenia PP uptake rate[F]-ppl developing osteoporosis with PP rate[F]-osteopenia with PP death rate[F]-osteopenia PP dropout rate[F]-treated osteopenia first other fx rate[F]-treated osteopenia first hip fx rate[F])*dt
INIT "ppl with osteopenia (with PP)"[F]	(Population 50 Plus*0.288)*0.1
ppl with osteopenia without PP[M](t)	ppl with osteopenia without PP[M](t-dt)+ (osteopenia PP dropout rate[M]+ ppl developing impaired bone health rate[M]-osteopenia PP uptake rate[M]-ppl developing osteoporosis rate[M]-osteopenia without meds death rate[M]-osteopenia without PP other fx rate[M]-osteopenia without PP first hip fx rate[M])*dt
INIT ppl with osteopenia without PP[M]	Population 50 Plus*0.418*0.9
ppl with osteopenia without PP[F](t)	ppl with osteopenia without PP[F](t-dt)+ (osteopenia PP dropout rate[F]+ ppl developing impaired bone health rate[F]-osteopenia PP uptake rate[F]-ppl developing osteoporosis rate[F]-osteopenia without meds death rate[F]-osteopenia without PP other fx rate[F]-osteopenia without PP first hip fx rate[F])*dt
INIT ppl with osteopenia without PP[F]	Population 50 Plus*0.288*0.9
ppl with osteoporosis (with meds)[M](t)	ppl with osteoporosis (with meds)[M](t-dt)+ (osteoporosis meds uptake rate[M]-osteoporosis with meds death rate[M]-osteoporosis meds dropout rate[M]-osteoporosis with medication first other fx rate[M]-osteoporosis with medication first hip fx rate[M])*dt
INIT "ppl with osteoporosis (with meds)"[M]	(Population 50 Plus*0.0089)
ppl with osteoporosis (with meds)[F](t)	ppl with osteoporosis (with meds)[F](t-dt)+ (osteoporosis meds uptake rate[F]-osteoporosis with meds death rate[F]-osteoporosis meds dropout rate[F]-osteoporosis with medication first other fx rate[F]-osteoporosis with medication first hip fx rate[F])*dt
INIT "ppl with osteoporosis (with meds)"[F]	(Population 50 Plus*0.0322)
ppl with osteoporosis without meds[M](t)	ppl with osteoporosis without meds[M](t-dt)+ (ppl developing osteoporosis rate[M]+ osteoporosis meds dropout rate[M]+ ppl developing osteoporosis with PP rate[M]-osteoporosis meds uptake rate[M]-osteoporosis without 2P death rate[M]-untreated osteoporosis first other fx rate[M]-osteoporosis without meds first hip fx rate[M])*dt
INIT ppl with osteoporosis without meds[M]	Population 50 Plus*0.0329
ppl with osteoporosis without meds[F](t)	ppl with osteoporosis without meds[F](t-dt)+ (ppl developing osteoporosis rate[F]+ osteoporosis meds dropout rate[F]+ ppl developing osteoporosis with PP rate[F]-osteoporosis meds uptake rate[F]-osteoporosis without meds death rate[F]-untreated osteoporosis first other fx rate[F]-osteoporosis without meds first hip fx rate[F])*dt
INIT ppl with osteoporosis without meds[F]	Population 50 Plus*0.099
treated osteopenia first hip fx rate[Gender]	number of osteopenic first hip fx (with PP) pa
treated osteopenia first other fx rate[Gender]	number of osteopenic sentinel other fx (with PP) pa

Model Variable	Values
tuning 50 rate[Gender]	Turning 50+ mig
untreated osteoporosis first other fx rate[Gender]	number of osteoporotic sentinel other fx (no meds) pa

primary care pre-fx:	

% normal population old[M]	20
% normal population old[F]	11.6
% osteopenic population old[M]	29
% osteopenic population old[F]	31
% osteoporotic population old[M]	60
% osteoporotic population old[F]	61
% referral rate for healthy ppl[Gender]	$((\% \text{ pa GP referral for DXA young}/100) * (1 - (\% \text{ normal population old}/100))) + ((\% \text{ pa GP referral for DXA old}/100) * (\% \text{ normal population old}/100))$
% referral rate for osteoporosis[Gender]	$((\% \text{ pa GP referral for DXA young}/100) * (1 - (\% \text{ osteoporotic population old}/100))) + ((\% \text{ pa GP referral for DXA old}/100) * (\% \text{ osteoporotic population old}/100))$
% referral rate for ostopenia[Gender]	$((\% \text{ pa GP referral for DXA young}/100) * (1 - (\% \text{ osteopenic population old}/100))) + ((\% \text{ pa GP referral for DXA old}/100) * (\% \text{ osteopenic population old}/100))$
confirmed osteopenia cases[Gender](t)	confirmed osteopenia cases[Gender](t-dt) + (getting early referral[Gender] + NRIAP 1[Gender] - people initiating early PP pa[Gender] - no early PP[Gender])*dt
INIT confirmed osteopenia cases[Gender]	0
confirmed osteoporosis cases pre-fx in specialist care[Gender](t)	confirmed osteoporosis cases pre-fx in specialist care[Gender](t-dt) + (Referral from GP to Specialist pre fx[Gender] - no specialist action prefx[Gender] - ppl with Specialist initiated meds pre fx[Gender])*dt
INIT "confirmed osteoporosis cases pre-fx in specialist care"[Gender]	Referral from GP to Specialist pre fx
death or fx rate rate[Gender]	osteopenia with PP death rate + osteopenia with PP fx rate + ppl developing osteoporosis with PP rate
death rate2[Gender]	osteoporosis with meds death rate
diagnosed osteoporosis cases[Gender](t)	diagnosed osteoporosis cases[Gender](t-dt) + (getting DXA referral[Gender] + NRIAP 2[Gender] - ppl initiating osteoporosis meds pa[Gender] - Referral from GP to Specialist pre fx[Gender] - no prefx meds[Gender])*dt
INIT diagnosed osteoporosis cases[Gender]	0
early health seeking[Gender]	(ppl with osteopenia without PP*(probability of visiting GP pa younger/100)) - NRIAP 1
early health seeking 1[Gender]	(ppl with normal bones by BMD - NRIAP 3)*(probability of visiting GP pa younger 1/100)

Model Variable	Values
getting DXA referral[Gender]	% referral rate for osteoporosis*ppl with osteoporosis at the GP
getting early referral[Gender]	ppl with osteopenia at the to GP**% referral rate for osteopenia
getting early referral with healthy BMD[Gender]	early health seeking 1**% referral rate for healthy ppl
Lapsed osteopenia PP[M](t)	Lapsed osteopenia PP[M](t-dt)+ (osteopenia PP lapsing rate[M]-osteopenia PP restart rate[M])*dt
INIT Lapsed osteopenia PP[M]	7500
Lapsed osteopenia PP[F](t)	Lapsed osteopenia PP[F](t-dt)+ (osteopenia PP lapsing rate[F]-osteopenia PP restart rate[F])*dt
INIT Lapsed osteopenia PP[F]	19000
NRIAP 1[Gender]	NRIAP screening.ppl with osteopenia tested through NRIAP
NRIAP 2[Gender]	NRIAP screening.ppl with osteoporosis tested through NRIAP
NRIAP 3[Gender]	NRIAP screening.ppl with normal BMD tested through NRIAP pa
no DXA referral older[Gender]	(1-% referral rate for osteoporosis)*ppl with osteoporosis at the GP
no early PP[Gender]	Total Annual Scans osteopenia*(1-(osteopenia PP initiation rate pre fx/100))
no early referral[Gender]	ppl with osteopenia at the to GP*(1-% referral rate for osteopenia)
no early referral 1[Gender]	1.00E+09
no pre fx meds[Gender]	Total Annual Scans osteoporosis[Gender]-(((Total Annual Scans osteoporosis[Gender]*(1-(% pa GP refer to specialist[Gender]/100)))*(% pa GP med initiation pre fx[Gender]/100))+ (Total Annual Scans osteoporosis[Gender]*(% pa GP refer to specialist[Gender]/100)))
no specialist action prefx[Gender]	confirmed osteoporosis cases pre-fx in specialist care*(1-(specialist med initiation rate pre fx/100))
older health seeking[Gender]	(ppl with osteoporosis without meds*(probability of visiting GP pa older/100))-NRIAP 2-ppl with lapsed osteoporosis meds
INIT older health seeking[Gender]	(ppl with osteoporosis without meds*(probability of visiting GP pa older/100))-NRIAP 2
osteopenia PP lapsing rate[Gender]	(HISTORY(people initiating early PP pa,TIME-1))*(osteopenia PP lapse %pa/100)
osteopenia PP restart rate[Gender]	Lapsed osteopenia PP*(osteopenia PP restart %pa/100)
osteopenia treatment dropping out pa[Gender]	ppl with osteopenia receiving PP*(osteopenia PP drop out %pa/100)
osteopenia with PP fx rate[Gender]	treated osteopenia first hip fx rate+ treated osteopenia first other fx rate
osteoporosis meds drop out[Gender]	ppl in osteoporosis meds treatment*(%pa drop out/100)
osteoporosis meds lapsing rate[Gender]	(HISTORY(ppl initiating osteoporosis meds pa,TIME-1)+ HISTORY(ppl with Specialist initiated meds pre fx,TIME-1))*(% pa osteoporosis meds lapse pre fx/100)
osteoporosis meds restart rate[Gender]	ppl with lapsed osteoporosis meds*(osteoporosis meds restart %pa/100)
people initiating early PP pa[Gender]	Total Annual Scans osteopenia*(osteopenia PP initiation rate pre fx/100)

Model Variable	Values
ppl in osteoporosis meds treatment[M](t)	ppl in osteoporosis meds treatment[M](t-dt)+ (ppl initiating osteoporosis meds pa[M]+ osteoporosis meds restart rate[M]+ ppl with Specialist initiated meds pre fx[M]-death rate2[M]-osteoporosis meds drop out[M]-osteoporosis meds lapsing rate[M]-ppl already on meds at time of hip fx[M]-ppl already on meds at time of other fx[M])*dt
INIT ppl in osteoporosis meds treatment[M]	(Population 50 Plus*0.0089)
ppl in osteoporosis meds treatment[F](t)	ppl in osteoporosis meds treatment[F](t-dt)+ (ppl initiating osteoporosis meds pa[F]+ osteoporosis meds restart rate[F]+ ppl with Specialist initiated meds pre fx[F]-death rate2[F]-osteoporosis meds drop out[F]-osteoporosis meds lapsing rate[F]-ppl already on meds at time of hip fx[F]-ppl already on meds at time of other fx[F])*dt
INIT ppl in osteoporosis meds treatment[F]	(Population 50 Plus*0.0322)
ppl initiating osteoporosis meds pa[Gender]	(Total Annual Scans osteoporosis[Gender]*(1-(% pa GP refer to specialist[Gender]/100)))*(% pa GP med initiation pre fx[Gender]/100)
ppl with lapsed osteoporosis meds[Gender](t)	ppl with lapsed osteoporosis meds[Gender](t-dt)+ (osteoporosis meds lapsing rate[Gender]-osteoporosis meds restart rate[Gender])*dt
INIT ppl with lapsed osteoporosis meds[Gender]	osteoporosis meds lapsing rate
ppl with normal BMD at the to GP[Gender](t)	ppl with normal BMD at the to GP[Gender](t-dt)+ (early health seeking 1[Gender]-getting early referral with healthy BMD[Gender]-no early referral 1[Gender])*dt
INIT ppl with normal BMD at the to GP[Gender]	0
ppl with osteopenia receiving PP[M](t)	ppl with osteopenia receiving PP[M](t-dt)+ (people initiating early PP pa[M]+ osteopenia PP restart rate[M]-death or fx rate rate[M]-osteopenia treatment dropping out pa[M]-osteopenia PP lapsing rate[M])*dt
INIT ppl with osteopenia receiving PP[M]	Population 50 Plus*0.5238*0.1
ppl with osteopenia receiving PP[F](t)	ppl with osteopenia receiving PP[F](t-dt)+ (people initiating early PP pa[F]+ osteopenia PP restart rate[F]-death or fx rate rate[F]-osteopenia treatment dropping out pa[F]-osteopenia PP lapsing rate[F])*dt
INIT ppl with osteopenia receiving PP[F]	(Population 50 Plus*0.3744)*0.1
ppl with osteoporosis at the GP[Gender](t)	ppl with osteoporosis at the GP[Gender](t-dt)+ (older health seeking[Gender]-no DXA referral older[Gender]-getting DXA referral[Gender])*dt
INIT ppl with osteoporosis at the GP[Gender]	older health seeking
ppl with osteopenia at the to GP[Gender](t)	ppl with osteopenia at the to GP[Gender](t-dt)+ (early health seeking[Gender]-getting early referral[Gender]-no early referral[Gender])*dt
INIT ppl with osteopenia at the to GP[Gender]	early health seeking
ppl with Specialist initiated meds pre fx[Gender]	confirmed osteoporosis cases pre-fx in specialist care*(specialist med initiation rate pre fx/100)
pre fx initiation	ppl initiating osteoporosis meds pa[M]+ ppl with Specialist initiated meds pre fx[M]
probability of visiting GP pa older[M]	92
probability of visiting GP pa older[F]	95

Model Variable	Values
probability of visiting GP pa younger[M]	92
probability of visiting GP pa younger[F]	95
probability of visiting GP pa younger 1[M]	92
probability of visiting GP pa younger 1[F]	95
Referral from GP to Specialist pre fx[Gender]	(Total Annual Scans osteoporosis[Gender]*(% pa GP refer to specialist[Gender]/100))
specialist med initiation rate pre fx[Gender]	% pa GP med initiation pre fx*1.5
Total Annual Scans normal[Gender]	NRIAP 3+ getting early referral with healthy BMD
Total Annual Scans osteoporosis[Gender]	NRIAP 2[Gender]+ getting DXA referral[Gender]
Total Annual Scans osteopenia[Gender]	NRIAP 1+ getting early referral

Primary care-post fx:	

% of other fx that report only to GP[Gender]	100-% of other fx that report to hospital
% other fx population old[M]	41
% other fx population old[F]	51
% other fx population old 1[M]	81
% other fx population old 1[F]	90
% pa GP refer to specialist[M]	10
% pa GP refer to specialist[F]	10
% post fx noshw to GP[M]	10
% post fx noshw to GP[F]	10
% referral rate for hip fx[Gender]	((%pa GP referral for DXA young/100)*(1-(% other fx population old 1/100)))+ ((%pa GP referral for DXA old/100)*(% other fx population old 1/100))
% referral rate for other fx[Gender]	((%pa GP referral for DXA young/100)*(1-(% other fx population old/100)))+ ((%pa GP referral for DXA old/100)*(% other fx population old/100))
% specialist med initiation rate post fx[Gender]	% pa GP med initiation post hip fx
confirmed osteoporosis cases post hip fx[Gender](t)	confirmed osteoporosis cases post hip fx[Gender](t-dt)+ (getting late referral post hip fx[Gender]+ hip fx ppl referred for GP management[Gender]+ NRIAP 4[Gender]-ppl with GP initiated meds post hip fx pa[Gender]-no GP action post hip fx[Gender]-Referral from GP to Specialist post hip FX[Gender])*dt

Model Variable	Values
INIT confirmed osteoporosis cases post hip fx[Gender]	0
confirmed osteoporosis cases post hip fx in specialist care[Gender](t)	confirmed osteoporosis cases post hip fx in specialist care[Gender](t-dt)+ (Referral from GP to Specialist post hip FX[Gender]+ Direct referral to specialist hip fx[Gender]-ppl with Specialist initiated meds post hip fx pa[Gender]-no specialist action post hip fx[Gender])*dt
INIT confirmed osteoporosis cases post hip fx in specialist care[Gender]	Referral from GP to Specialist post hip fx
confirmed osteoporosis cases post other fx[Gender](t)	confirmed osteoporosis cases post other fx[Gender](t-dt)+ (getting DXA referral post fx rate[Gender]+ ppl referred for GP management[Gender]+ getting referral post fx[Gender]+ NRIAP 5[Gender]-ppl initiating meds post other fx pa[Gender]-no meds post fx rate[Gender]-Referral from GP to Specialist post other fx[Gender])*dt
INIT confirmed osteoporosis cases post other fx[Gender]	0
confirmed osteoporosis cases post other fx in specialist care[Gender](t)	confirmed osteoporosis cases post other fx in specialist care[Gender](t-dt)+ (Referral from GP to Specialist post other fx[Gender]+ Direct referral to specialist other fx[Gender]-ppl with Specialist initiated meds post other fx pa[Gender]-no specialist action post other fx[Gender])*dt
INIT confirmed osteoporosis cases post other fx in specialist care[Gender]	Referral from GP to Specialist post other fx+ Direct referral to specialist other fx
death or fx rate 4[Gender]	medicated first hip fx fx-related death rate+ second hip fx rate (with meds)
death rate post other fx[Gender]	medicated other fx fx-related death rate
Direct referral to specialist hip fx[Gender]	ppl referred to specialist for management[Gender,Hipfx]
Direct referral to specialist other fx[Gender]	ppl referred to specialist for management[Gender,Otherfx]
getting DXA referral post fx rate[Gender]	ppl with sentinel fx routine GP visit*(% referral rate for other fx)
getting late referral post hip fx[Gender]	ppl with hip fx routine GP visit*(% referral rate for hip fx)
getting referral post fx[Gender]	ppl presenting to GP for fx*(probability of DXA referral during fx presentation/100)
health seeking post fx rate[Gender]	(ppl with sentinel other fx (without meds)*(probability of visiting GP pa older/100))-number of ppl with fx presenting directly to GP pa-ppl referred to GP from SFPP for maintenance-ppl referred for GP management-Direct referral to specialist other fx-NRIAP 5-ppl with lapsed osteoporosis meds post other fx
INIT health seeking post fx rate[Gender]	(ppl with sentinel other fx (without meds)*(probability of visiting GP pa older/100))-number of ppl with fx presenting directly to GP pa-ppl referred to GP from SFPP for maintenance-ppl referred for GP management-Direct referral to specialist other fx-NRIAP 5
health seeking post hip fx[Gender]	(ppl with sentinel hip fx (without meds)*(probability of visiting GP pa older/100))-hip fx ppl referred to GP from SFPP for maintenance-hip fx ppl referred for GP management-Direct referral to specialist hip fx-NRIAP 4-ppl with lapsed osteoporosis meds post hip fx

Model Variable	Values
INIT health seeking post hip fx[Gender]	(ppl with sentinel hip fx (without meds)*(probability of visiting GP pa older/100))-hip fx ppl referred to GP from SFPP for maintenance-hip fx ppl referred for GP management-Direct referral to specialist hip fx-NRIAP 4
hip fx ppl referred for GP management[Gender]	people going to GP for management[Gender,Hipfx]+ ((ppl exiting OGS not on meds[Gender,Hipfx]+ ppl exiting FLS not on meds[Gender,Hipfx])*(1-(% post fx no show to GP/100)))
hip fx ppl referred to GP from SFPP for maintenance[Gender]	(ppl exiting OGS on new meds[Gender,Hipfx]+ ppl exiting FLS on newly initiated meds[Gender,Hipfx]+ Inpatient hip fx initiating meds in hospital[Gender,no,Hipfx])*(1-(% post fx no show to GP/100))
In GP-managed osteoporosis meds treatment post fx[M](t)	In GP-managed osteoporosis meds treatment post fx[M](t-dt)+ (ppl initiating meds post other fx pa[M]+ ppl referred to GP from SFPP for maintenance[M]+ osteoporosis meds restart rate post other fx[M]+ ppl already on meds at time of other fx[M]+ ppl with Specialist initiated meds post other fx pa[M]-death rate post other fx[M]-post fx meds drop out[M]-osteoporosis meds lapsing rate post other fx[M]-ppl already on meds at time of hip fx[M])*dt
INIT "In GP-managed osteoporosis meds treatment post fx"[M]	Population 50 Plus*0.0169
In GP-managed osteoporosis meds treatment post fx[F](t)	In GP-managed osteoporosis meds treatment post fx[F](t-dt)+ (ppl initiating meds post other fx pa[F]+ ppl referred to GP from SFPP for maintenance[F]+ osteoporosis meds restart rate post other fx[F]+ ppl already on meds at time of other fx[F]+ ppl with Specialist initiated meds post other fx pa[F]-death rate post other fx[F]-post fx meds drop out[F]-osteoporosis meds lapsing rate post other fx[F]-ppl already on meds at time of hip fx[F])*dt
INIT "In GP-managed osteoporosis meds treatment post fx"[F]	Population 50 Plus*0.058
NRIAP 4[Gender]	NRIAP screening.ppl with Sentinel hip FX tested through NRIAP
NRIAP 5[Gender]	NRIAP screening.ppl with Sentinel hip FX tested through NRIAP
no GP action post hip fx[Gender]	(Total Annual post hip fx GP decision 1*(1-(% pa GP refer to specialist/100)))*(1-(% pa GP med initiation post hip fx/100))
no late referral post hip fx rate[Gender]	ppl with sentinel fx routine GP visit*(1-(% referral rate for other fx))
no late referral post hip fx[Gender]	ppl with hip fx routine GP visit*(1-(% referral rate for hip fx))
no meds post fx rate[Gender]	(Total Annual post other fx GP decision*(1-(% pa GP refer to specialist/100)))*(1-(% pa GP med initiation post other fx/100))
no post fx referral[Gender]	ppl presenting to GP for fx*(1-(probability of DXA referral during fx presentation/100))
no specialist action post hip fx[Gender]	confirmed osteoporosis cases post hip fx in specialist care*(1-(% specialist med initiation rate post fx/100))
no specialist action post other fx[Gender]	confirmed osteoporosis cases post other fx in specialist care*(1-(specialist med initiation rate post other fx/100))
number of ppl with fx presenting directly to GP pa[Gender]	total number of no meds other fx*(% of other fx that report only to GP/100)
On GP-managed osteoporosis meds post hip fx[M](t)	On GP-managed osteoporosis meds post hip fx[M](t-dt)+ (ppl with GP initiated meds post hip fx pa[M]+ hip fx ppl referred to GP from SFPP for maintenance[M]+ osteoporosis meds restart rate post hip fx[M]+ ppl already on meds at time of hip fx[M]+ ppl already on meds at time of hip fx[M]+ ppl with Specialist initiated meds post hip fx pa[M]-death or fx rate 4[M]-post hip fx meds drop out[M]-osteoporosis meds lapsing rate post hip fx[M])*dt

Model Variable	Values
INIT "On GP-managed osteoporosis meds post hip fx"[M]	1410*6
On GP-managed osteoporosis meds post hip fx[F](t)	On GP-managed osteoporosis meds post hip fx[F](t-dt)+ (ppl with GP initiated meds post hip fx pa[F]+ hip fx ppl referred to GP from SFPP for maintenance[F]+ osteoporosis meds restart rate post hip fx[F]+ ppl already on meds at time of hip fx[F]+ ppl already on meds at time of hip fx[F]+ ppl with Specialist initiated meds post hip fx pa[F]-death or fx rate 4[F]-post hip fx meds drop out[F]-osteoporosis meds lapsing rate post hip fx[F])*dt
INIT "On GP-managed osteoporosis meds post hip fx"[F]	3384*6
osteoporosis meds lapsing rate post hip fx[Gender]	(HISTORY(ppl with GP initiated meds post hip fx pa,TIME-1)+ HISTORY(hip fx ppl referred to GP from SFPP for maintenance,TIME-1)+ HISTORY(ppl with Specialist initiated meds post hip fx pa,TIME-1))*(osteoporosis meds lapse post fx %pa/100)
osteoporosis meds lapsing rate post other fx[Gender]	(HISTORY(ppl initiating meds post other fx pa,TIME-1)+ (HISTORY(ppl referred to GP from SFPP for maintenance,TIME-1))+ (HISTORY(ppl with Specialist initiated meds post other fx pa,TIME-1)))*(osteoporosis meds lapse post fx %pa/100)
osteoporosis meds restart rate post hip fx[Gender]	ppl with lapsed osteoporosis meds post hip fx*(osteoporosis meds restart %pa/100)
osteoporosis meds restart rate post other fx[Gender]	ppl with lapsed osteoporosis meds post other fx*(osteoporosis meds restart %pa/100)
post fx meds drop out[Gender]	In GP-managed osteoporosis meds treatment post fx*(%pa drop out/100)
post hip fx meds drop out[Gender]	On GP-managed osteoporosis meds post hip fx*(%pa drop out/100)
ppl already on meds at time of hip fx[Gender]	osteoporosis with medication first hip fx rate
ppl already on meds at time of hip fx[Gender]	other fx to hip fx rate (with meds)
ppl already on meds at time of other fx[Gender]	osteoporosis with medication first other fx rate
ppl initiating meds post other fx pa[Gender]	(Total Annual post other fx GP decision*(1-(% pa GP refer to specialist/100)))*(% pa GP med initiation post other fx/100)
ppl presenting to GP for fx[Gender](t)	ppl presenting to GP for fx[Gender](t-dt)+ (present direct to GP post other fx rate[Gender]-getting referral post fx[Gender]-no post fx referral[Gender])*dt
INIT ppl presenting to GP for fx[Gender]	present direct to GP post other fx rate
ppl referred for GP management[Gender]	people going to GP for management[Gender,Otherfx]+ (+ ppl exiting FLS not on meds[Gender,Otherfx]*(1-(% post fx no show to GP/100)))
ppl referred to GP from SFPP for maintenance[Gender]	ppl exiting FLS on newly initiated meds[Gender,Otherfx]*(1-(% post fx no show to GP/100))
ppl with GP initiated meds post hip fx pa[Gender]	(Total Annual post hip fx GP decision 1*(1-(% pa GP refer to specialist/100)))*(% pa GP med initiation post hip fx/100)
ppl with hip fx routine GP visit[Gender](t)	ppl with hip fx routine GP visit[Gender](t-dt)+ (health seeking post hip fx[Gender]-no late referral post hip fx[Gender]-getting late referral post hip fx[Gender])*dt
INIT ppl with hip fx routine GP visit[Gender]	health seeking post hip fx

Model Variable	Values
ppl with lapsed osteoporosis meds post hip fx[Gender](t)	ppl with lapsed osteoporosis meds post hip fx[Gender](t-dt)+ (osteoporosis meds lapsing rate post hip fx[Gender]-osteoporosis meds restart rate post hip fx[Gender])*dt
INIT ppl with lapsed osteoporosis meds post hip fx[Gender]	osteoporosis meds lapsing rate post hip fx*2
ppl with lapsed osteoporosis meds post other fx[Gender](t)	ppl with lapsed osteoporosis meds post other fx[Gender](t-dt)+ (osteoporosis meds lapsing rate post other fx[Gender]-osteoporosis meds restart rate post other fx[Gender])*dt
INIT ppl with lapsed osteoporosis meds post other fx[Gender]	osteoporosis meds lapsing rate post other fx*2
ppl with sentinel fx routine GP visit[Gender](t)	ppl with sentinel fx routine GP visit[Gender](t-dt)+ (health seeking post fx rate[Gender]-no late referral post fx rate[Gender]-getting DXA referral post fx rate[Gender])*dt
INIT ppl with sentinel fx routine GP visit[Gender]	health seeking post fx rate
ppl with Specialist initiated meds post hip fx pa[Gender]	confirmed osteoporosis cases post hip fx in specialist care*(% specialist med initiation rate post fx/100)
ppl with Specialist initiated meds post other fx pa[Gender]	confirmed osteoporosis cases post other fx in specialist care*(specialist med initiation rate post other fx/100)
present direct to GP post other fx rate[Gender]	number of ppl with fx presenting directly to GP pa
Referral from GP to Specialist post hip fx[Gender]	(Total Annual post hip fx GP decision 1*(% pa GP refer to specialist/100))
Referral from GP to Specialist post other fx[Gender]	(Total Annual post other fx GP decision*(% pa GP refer to specialist/100))
specialist med initiation rate post other fx[Gender]	% pa GP med initiation post other fx
Total Annual post hip fx GP decision 1[Gender]	hip fx ppl referred for GP management+ Total Annual Scans hip other fx 1
Total Annual post other fx GP decision[Gender]	Total Annual Scans post other fx+ ppl referred for GP management
Total Annual Scans hip other fx 1[Gender]	NRIAP 4+ getting late referral post hip fx
Total Annual Scans post other fx[Gender]	getting DXA referral post fx rate+ getting referral post fx+ NRIAP 5
total number of no meds other fx[Gender]	number of normal BMD first other fx pa+ number of osteopenic sentinel other fx (no PP) pa+ number of osteopenic sentinel other fx (with PP) pa+ number of osteoporotic sentinel other fx (no 2P) pa+ number of unmedicated other fx from other fx

Repeat minimal trauma fx:	

number of medicated first hip fx from other[Gender]	((number of treated post other fx falls*(1-(% med users noncompliant/100))*(probability of hip fx fall - osteoporosis (no meds)*medication effect modifier hip fx))+ (number of treated post other fx falls*(% med users noncompliant/100)*(probability of hip fx fall - osteoporosis (no meds)*noncompliant medication effect modifier hip fx)))*relative risk of second other fx unmedicated

Model Variable	Values
number of medicated other fx from other fx[Gender]	$((\text{number of treated post other fx falls} + \text{number of treated post hip fx falls}) * (1 - (\% \text{ med users noncompliant}/100))) * (\text{probability of other fx given fall} - \text{osteoporosis (no meds)} * \text{medication effect modifier other fx}) + ((\text{number of treated post hip fx falls} + \text{number of treated post other fx falls}) * (\% \text{ med users noncompliant}/100)) * (\text{probability of other fx given fall} - \text{osteoporosis (no meds)} * \text{noncompliant medication effect modifier hip fx})) * \text{relative risk of second other fx unmedicated 1}$
number of medicated second hip fx[Gender]	$((\text{number of treated post hip fx falls} * (1 - (\% \text{ med users noncompliant}/100))) * (\text{probability of hip fx fall} - \text{osteoporosis (no meds)} * \text{medication effect modifier hip fx}) + (\text{number of treated post hip fx falls} * (\% \text{ med users noncompliant}/100)) * (\text{probability of hip fx fall} - \text{osteoporosis (no meds)} * \text{noncompliant medication effect modifier hip fx})) * \text{relative risk of second hip fx unmedicated}$
number of unmedicated first hip fx from other fx[Gender]	number of untreated post other fx falls * (probability of hip fx fall - osteoporosis (no meds) * relative risk of second other fx unmedicated)
number of unmedicated other fx from other fx[Gender]	(number of untreated post hip fx falls + number of untreated post other fx falls) * (probability of other fx given fall - osteoporosis (no meds) * relative risk of second other fx unmedicated 1)
number of unmedicated second hip fx[Gender]	number of untreated post hip fx falls * (probability of hip fx fall - osteoporosis (no meds) * relative risk of second hip fx unmedicated)

Sentinel Minimal Trauma fx:	

% of vert fx not associated with fall[M]	70
% of vert fx not associated with fall[F]	70
effect modifier other fx	1
incidence rate of vert fx normal BMD pa[M]	0.002
incidence rate of vert fx normal BMD pa[F]	0.0045
incidence rate of vert fx osteopenia[M]	0.002
incidence rate of vert fx osteopenia[F]	0.0045
incidence rate of vert fx osteoporosis[M]	0.005
incidence rate of vert fx osteoporosis[F]	0.008
medication effect modifier hip fx	0.6
medication effect modifier other fx	0.8
medication effect modifier vert fx	0.32
medication non-compliance effect modifier	50
noncompliant PP effect modifier hip fx	$(\text{PP effect modifier hip fx}) + ((1 - \text{PP effect modifier hip fx}) * (\text{PP non-compliance effect modifier}/100))$
noncompliant medication effect modifier hip fx	$(\text{medication effect modifier hip fx}) + ((1 - \text{medication effect modifier hip fx}) * (\text{medication non-compliance effect modifier}/100))$

Model Variable	Values
noncompliant medication effect modifier other fx	(medication effect modifier other fx)+ ((1-medication effect modifier other fx)*(medication non-compliance effect modifier/100))
Noncompliant PP effect modifier other fx	(effect modifier other fx)+ ((1-effect modifier other fx)*(PP non-compliance effect modifier/100))
number of medicated osteoporosis sentinel non-fall other fx[Gender]	(ppl with osteoporosis (with meds)*(incidence rate of vert fx osteoporosis*medication effect modifier vert fx)*(% of vert fx not associated with fall/100))
number of no PP osteopenia sentinel non-fall other fx[Gender]	(ppl with osteopenia without PP*incidence rate of vert fx osteopenia*(% of vert fx not associated with fall/100))
number of normal BMD first other fx pa[Gender]	(number of normal BMD falls pa*probability of other fx given fall - normal BMD+ number of normal BMD sentinel non-fall other fx)*(sentinel fx modifier/100)
number of normal BMD sentinel hip fx pa[Gender]	number of normal BMD falls pa*probability of hip fx given fall - normal BMD
number of normal BMD sentinel non-fall other fx[Gender]	(ppl with normal bones by BMD*incidence rate of vert fx normal BMD pa)*((% of vert fx not associated with fall/100))
number of osteopenic first hip fx (no PP) pa[Gender]	number of no PP osteopenia falls pa*probability of hip fx given fx - osteopenia (no PP)
number of osteopenic first hip fx (with PP) pa[Gender]	(number of PP osteopenic falls pa*(1-(% PP users noncompliant/100))*(probability of hip fx given fx - osteopenia (no PP)*PP effect modifier hip fx))+ (number of PP osteopenic falls pa*(% PP users noncompliant/100)*(probability of hip fx given fx - osteopenia (no PP)*noncompliant PP effect modifier hip fx)
number of osteopenic sentinel other fx (no PP) pa[Gender]	((number of no PP osteopenia falls pa*probability of other fx given fall - osteopenia (no PP))+ number of no PP osteopenia sentinel non-fall other fx)*(sentinel fx modifier/100)
number of osteopenic sentinel other fx (with PP) pa[Gender]	(((((number of PP osteopenic falls pa*(1-(% PP users noncompliant/100))*probability of other fx given fall - osteopenia (no PP)*effect modifier other fx))+ (number of PP osteopenic falls pa*(% PP users noncompliant/100)*(probability of other fx given fall - osteopenia (no PP)*noncompliant PP effect modifier other fx)))+ number of PP osteopenia sentinel non-fall other fx)*(sentinel fx modifier/100)
number of osteoporotic first hip fx (with meds) pa[Gender]	(number of treated osteoporosis falls per year*(1-(% med users noncompliant/100))*(probability of hip fx fall - osteoporosis (no meds)*medication effect modifier hip fx))+ (number of treated osteoporosis falls per year*(% med users noncompliant/100)*(probability of hip fx fall - osteoporosis (no meds)*noncompliant medication effect modifier hip fx))
number of osteoporotic other first fx (with meds) pa[Gender]	((number of treated osteoporosis falls per year*(1-(% med users noncompliant/100))*(probability of other fx given fall - osteoporosis (no meds)*medication effect modifier other fx))+ (number of treated osteoporosis falls per year*(% med users noncompliant/100)*(probability of other fx given fall - osteoporosis (no meds)*noncompliant medication effect modifier other fx)))+ number of medicated osteoporosis sentinel non-fall other fx)*(sentinel fx modifier/100)
number of osteoporotic sentinel hip fx (no 2P)pa[Gender]	number of untreated osteoporotic falls pa*probability of hip fx fall - osteoporosis (no meds)
number of osteoporotic sentinel other fx (no 2P) pa[Gender]	(number of untreated osteoporotic falls pa*probability of other fx given fall - osteoporosis (no meds)+ number of unmedicated osteoporosis sentinel non-fall other fx)*(sentinel fx modifier/100)
number of PP osteopenia sentinel non-fall other fx[Gender]	(ppl with osteopenia (with PP)*(incidence rate of vert fx osteopenia*effect modifier other fx)*(% of vert fx not associated with fall/100))

Model Variable	Values
number of unmedicated osteoporosis sentinel non-fall other fx[Gender]	(ppl with osteoporosis without meds*incidence rate of vert fx osteoporosis*(% of vert fx not associated with fall/100))
PP effect modifier hip fx	1
PP non-compliance effect modifier	50
probability of hip fx given fall - normal BMD[M]	0.003
probability of hip fx given fall - normal BMD[F]	0.001
probability of hip fx given fx - osteopenia (no PP)[M]	0.003
probability of hip fx given fx - osteopenia (no PP)[F]	0.007
probability of hip fx fall - osteoporosis (no meds)[M]	0.005
probability of hip fx fall - osteoporosis (no meds)[F]	0.009
probability of other fx given fall - normal BMD[M]	0.013
probability of other fx given fall - normal BMD[F]	0.024
probability of other fx given fall - osteopenia (no PP)[M]	0.034
probability of other fx given fall - osteopenia (no PP)[F]	0.043
probability of other fx given fall - osteoporosis (no meds)[M]	0.069
probability of other fx given fall - osteoporosis (no meds)[F]	0.084
sentinel fx modifier[M]	75
sentinel fx modifier[F]	60

totals:	

% med users noncompliant[M]	10
% med users noncompliant[F]	10
% of non-vert other fx admitted to hospital[M]	67
% of non-vert other fx admitted to hospital[F]	67

Model Variable	Values
% of other fx that report to hospital[M]	85
% of other fx that report to hospital[F]	85
% PP users noncompliant[M]	10
% PP users noncompliant[F]	10
new patients that can be seen by SFPP per month	40
osteopenia PP drop out %pa[M]	0.01
osteopenia PP drop out %pa[F]	0.01
osteopenia PP initiation rate pre fx[M]	25
osteopenia PP initiation rate pre fx[F]	25
osteopenia PP lapse %pa[M]	40
osteopenia PP lapse %pa[F]	40
osteopenia PP restart %pa[M]	25
osteopenia PP restart %pa[F]	25
other fx-related death rate modifier[M]	1.046
other fx-related death rate modifier[F]	1.036

Interventions below were not evaluated in the current manuscript, however included in the broader model equations	
Bone Health Media Campaign."% decrease in do nothing rate at full coverage"	10
Bone Health Media Campaign."% decrease in quit rate at full coverage"	10
Bone Health Media Campaign."% increase in DXA scan rate at full coverage"	10
Bone Health Media Campaign."% increase in treatment initiation at full coverage"	10
Bone Health Media Campaign.campaign Active(t)	campaign Active(t-dt)+ (start+ restart campaign-finished pulse)*dt
INIT Bone Health Media Campaign.campaign Active	0
TRANSIT TIME	months active pa/12

Model Variable	Values
Bone Health Media Campaign.campaign Dormant(t)	campaign Dormant(t-dt)+ (fin pulse-restart campaign-finished campaign)*dt
INIT Bone Health Media Campaign.campaign Dormant	0
TRANSIT TIME	1-months active pa/12
Bone Health Media Campaign."Campaign Off\On"	0
Bone Health Media Campaign.Campaign Stop Time	starting year+ Length of SMC campaign yrs
Bone Health Media Campaign.Cost profile \$[Funding level]	(Initial Flag Fall+ Running Costs+ Refresh costs)*.inflation modifier*.NPV factor
Bone Health Media Campaign.finished pulse	CONVEYOROUTFLOW
Bone Health Media Campaign.finished campaign	LEAKAGEOUTFLOW
LEAKAGE FRACTION	IF TIME>=Campaign Stop Time THEN 1e6 ELSE 0
Bone Health Media Campaign.Flow 36	(campaign Active*(Max reach target*(healthy bones campaign uptake curve/100))-Social Marketing campaign reach)/DT
Bone Health Media Campaign.Flow 37	Social Marketing campaign reach/forgetting curve
Bone Health Media Campaign.Flow 38	finished pulse
Bone Health Media Campaign.forgetting curve	GRAPH(total years run/Length of SMC campaign yrs)
(0.000, 1.000), (0.200, 0.994), (0.400, 2.033), (0.600, 3.509), (0.800, 4.232), (1.000, 4.413)	
Bone Health Media Campaign.healthy bones campaign uptake curve	GRAPH((TIME-starting year)/Length of SMC campaign yrs*100) (0.0, 0.0), (10.0, 50.6), (20.0, 72.6), (30.0, 85.5), (40.0, 91.6), (50.0, 94.9), (60.0, 96.7), (70.0, 98.2), (80.0, 98.5), (90.0, 99.4), (100.0, 100.0)
Bone Health Media Campaign.Impact of SMC on do nothing rate	1-((% decrease in do nothing rate at full coverage/100)*SMC on do nothing rate curve)
Bone Health Media Campaign.Impact of SMC on DXA scan rate	1+ ((% increase in DXA scan rate at full coverage/100)*SMC on DXA scan curve)
Bone Health Media Campaign.Impact of SMC on quit rate	1-((% decrease in quit rate at full coverage/100)*SMC on quit rate curve)
Bone Health Media Campaign.Impact of SMC on treatment initiation rate	1+ ((% increase in treatment initiation at full coverage/100)*SMC on treatment initiation curve)
Bone Health Media Campaign.inc costs[Funding level]	Cost profile \$
Bone Health Media Campaign.Initial Flag Fall[Funding level]	start*Socail marketing campaign upfront cost
Bone Health Media Campaign.Length of SMC campaign yrs	5

Model Variable	Values
Bone Health Media Campaign.Max reach target	80
Bone Health Media Campaign.Media campaign annual cost[Funding level]	inc costs*DT
Bone Health Media Campaign.months active pa	3
Bone Health Media Campaign.Refresh costs[Funding level]	Refresh costs per season*restart campaign
Bone Health Media Campaign.Refresh costs per season[Fed]	200000
Bone Health Media Campaign.Refresh costs per season[Sta]	0
Bone Health Media Campaign.Refresh costs per season[OOP]	0
Bone Health Media Campaign.restart campaign	CONVEYOROUTFLOW
Bone Health Media Campaign.Running Costs[Funding level]	Social marketing campaign ongoing cost*campaign Active*12
Bone Health Media Campaign.SMC on do nothing rate curve	GRAPH(Social Marketing campaign reach)(0.0, 0.000), (10.0, 0.012), (20.0, 0.086), (30.0, 0.176), (40.0, 0.303), (50.0, 0.529), (60.0, 0.795), (70.0, 0.902), (80.0, 0.967), (90.0, 0.996), (100.0, 1.000)
Bone Health Media Campaign.SMC on DXA scan curve	GRAPH(Social Marketing campaign reach) (0.0, 0.000), (10.0, 0.012), (20.0, 0.086), (30.0, 0.176), (40.0, 0.303), (50.0, 0.529), (60.0, 0.795), (70.0, 0.902), (80.0, 0.967), (90.0, 0.996), (100.0, 1.000)
Bone Health Media Campaign.SMC on quit rate curve	GRAPH(Social Marketing campaign reach) (0.0, 0.000), (10.0, 0.012), (20.0, 0.086), (30.0, 0.176), (40.0, 0.303), (50.0, 0.529), (60.0, 0.795), (70.0, 0.902), (80.0, 0.967), (90.0, 0.996), (100.0, 1.000)
Bone Health Media Campaign.SMC on treatment initiation curve	GRAPH(Social Marketing campaign reach) (0.0, 0.000), (10.0, 0.012), (20.0, 0.086), (30.0, 0.176), (40.0, 0.303), (50.0, 0.529), (60.0, 0.795), (70.0, 0.902), (80.0, 0.967), (90.0, 0.996), (100.0, 1.000)
Bone Health Media Campaign.Social marketing campaign ongoing cost[Fed]	1800000/months active pa
Bone Health Media Campaign.Social marketing campaign ongoing cost[Sta]	0
Bone Health Media Campaign.Social marketing campaign ongoing cost[OOP]	0
Bone Health Media Campaign.Social Marketing campaign reach(t)	Social Marketing campaign reach(t-dt)+ (Flow 36-Flow 37)*dt
INIT Bone Health Media Campaign.Social Marketing campaign reach	0

Model Variable	Values
Bone Health Media Campaign.Social marketing campaign upfront cost[Federal]	800000
Bone Health Media Campaign.Social marketing campaign upfront cost[State]	0
Bone Health Media Campaign.Social marketing campaign upfront cost[OOP]	0
Bone Health Media Campaign.start	IF TIME=starting year THEN 1/DT*Campaign Off\On ELSE 0
Bone Health Media Campaign.starting year	2019.5
Bone Health Media Campaign.Years residual memory	5
E-decision support tool & GP Education. "% cost covered by the state"	10
E-decision support tool & GP Education. "% of Doctors using updated EMR software"	(Max % of Doctors with aligned EMR software* (EMR uptake curve/100))*((Max % of Doctors with software who use it effectively with ERM alone+ increase in uptake from GP visits)/100)
E-decision support tool & GP Education.Active GP Visited %	GPs Visited/(Number of GPs*(Max % of Doctors with aligned EMR software/100))*100
E-decision support tool & GP Education. Annual Code mtce[Funding level]	IF TIME>Year to Start EMR+ Time to Implement Code THEN Annual mtce cost ELSE 0
E-decision support tool & GP Education.annual ERM costs[Fed]	total annual ERM costs*(1-(% cost covered by the state/100))
E-decision support tool & GP Education.annual ERM costs[Sta]	total annual ERM costs*(% cost covered by the state/100)
E-decision support tool & GP Education.annual ERM costs[OOP]	0
E-decision support tool & GP Education. Annual GP Education Cost[Funding level]	GP visits per year*Cost per GP Visit
E-decision support tool & GP Education .Annual growth rate in GPs % pa	3.39
E-decision support tool & GP Education.Annual mtce cost[Federal]	146000
E-decision support tool & GP Education.Annual mtce cost[State]	0
E-decision support tool & GP Education.Annual mtce cost[OOP]	0

Model Variable	Values
E-decision support tool & GP Education."Annual total GP education and e-tool intervention cost"[Funding level]	(annual ERM costs+ Annual GP Education Cost)*.inflation modifier*.NPV factor
E-decision support tool & GP Education.Cost per GP Visit[Federal]	200
E-decision support tool & GP Education.Cost per GP Visit[State]	0
E-decision support tool & GP Education.Cost per GP Visit[OOP]	0
E-decision support tool & GP Education."e-clinical decision support tool Roll Out"	GRAPH(Elapsed EMR Time %)(0.0, 0.0), (10.0, 0.0), (20.0, 1.3), (30.0, 6.6), (40.0, 16.7), (50.0, 29.8), (60.0, 42.1), (70.0, 63.2), (80.0, 84.2), (90.0, 96.5), (100.0, 100.0)
E-decision support tool & GP Education.Elapsed EMR Time %	(TIME-(Year to Start EMR+ Time to Implement Code))/Years to Roll out updates*EMR Off\\On*100
E-decision support tool & GP Education.Elapsed GP education Time %	(TIME-(Year to Start GP Education))/Years to Visit all GPs*GP Education Off\\On*100
E-decision support tool & GP Education.EMR Code Flag Fall \$[Federal]	45000
E-decision support tool & GP Education.EMR Code Flag Fall \$[State]	0
E-decision support tool & GP Education.EMR Code Flag Fall \$[OOP]	0
E-decision support tool & GP Education.EMR Costs \$M[Federal](t)	EMR Costs \$M[Fed](t-dt)+ (inc EMR costs[Fed])*dt
INIT "E-decision support tool & GP Education".EMR Costs \$M[Federal]	0
E-decision support tool & GP Education.EMR Costs \$M[State](t)	EMR Costs \$M[Sta](t-dt)+ (inc EMR costs[Sta])*dt
INIT "E-decision support tool & GP Education".EMR Costs \$M[State]	0
E-decision support tool & GP Education.EMR Costs \$M[OOP](t)	EMR Costs \$M[OOP](t-dt)+ (inc EMR costs[OOP])*dt
INIT "E-decision support tool & GP Education".EMR Costs \$M[OOP]	0

Model Variable	Values
E-decision support tool & GP Education.EMR FF[Funding level]	IF TIME = Year to Start EMR THEN EMR Code Flag Fall \$/DT ELSE 0
E-decision support tool & GP Education."EMR Off\On"	0
E-decision support tool & GP Education.EMR uptake curve	GRAPH((TIME-(Year to Start EMR+ Time to Implement Code))/Year to full GP uptake*100) (0.0, 0.0), (10.0, 50.6), (20.0, 72.6), (30.0, 85.5), (40.0, 91.6), (50.0, 94.9), (60.0, 96.7), (70.0, 98.2), (80.0, 98.5), (90.0, 99.4), (100.0, 100.0)
E-decision support tool & GP Education .ERM Intervention DXA referral multiplier	Max % Increase in DXA Referral from ERM/100*e-clinical decision support tool Roll Out/100*% of Doctors using updated EMR software/100
E-decision support tool & GP Education. ERM Intervention initiating rate multiplier	Max % Increase in initiating rate/100*e-clinical decision support tool Roll Out/100*% of Doctors using updated EMR software/100
E-decision support tool & GP Education. ERM Intervention restart rate multiplier	Max % Increase in Restart rate/100*e-clinical decision support tool Roll Out/100*% of Doctors using updated EMR software/100
E-decision support tool & GP Education.GP Education Rollout	GRAPH(Elapsed GP education Time %) (0.0, 0.0), (10.0, 0.0), (20.0, 1.3), (30.0, 6.6), (40.0, 16.7), (50.0, 32.5), (60.0, 58.8), (70.0, 80.7), (80.0, 94.7), (90.0, 98.2), (100.0, 100.0)
E-decision support tool & GP Education."GP Education Off\On"	0
E-decision support tool & GP Education.GP visits per year	MIN(Max Visits pa,GPs to visit-GPs Visited)
E-decision support tool & GP Education.GPs retiring	GPs Visited*GPs retiring % pa/100
E-decision support tool & GP Education.GPs retiring % pa	1.5
E-decision support tool & GP Education.GPs to visit	((Number of GPs*(Max % of Doctors with aligned EMR software/100))*GP Education Rollout/100)
E-decision support tool & GP Education.GPs Visited(t)	GPs Visited(t-dt)+ (GP visits pa-GPs retiring)*dt
INIT "E-decision support tool & GP Education".GPs Visited	0
E-decision support tool & GP Education.inc EMR costs[Funding level]	annual ERM costs
E-decision support tool & GP Education.inc GP Visit cost[Funding level]	Annual GP Education Cost
E-decision support tool & GP Education.inc GP Visit cost and ERM cost[Funding level]	Annual total GP ed and e-tool intervention cost
E-decision support tool & GP Education.inc GPs	Number of GPs*Annual growth rate in GPs % pa/100

Model Variable	Values
E-decision support tool & GP Education.increase in uptake from GP visits	max increase in uptake from GP visits*(Active GP Visited %/100)
E-decision support tool & GP Education. Max % Increase in DXA Referral from ERM	10
E-decision support tool & GP Education.Max % Increase in initiating rate	10
E-decision support tool & GP Education.Max % Increase in Restart rate	9.8
E-decision support tool & GP Education.Max % of Doctors with aligned EMR software	81.4
E-decision support tool & GP Education. Max % of Doctors with software who use it effectively with ERM alone	40
E-decision support tool & GP Education. max increase in uptake from GP visits	50
E-decision support tool & GP Education.Max Visits pa	8000
E-decision support tool & GP Education.Number of GPs(t)	Number of GPs(t-dt)+ (inc gps)*dt
INIT "E-decision support tool & GP Education".Number of GPs	28503
E-decision support tool & GP Education.Time to Implement Code	1
E-decision support tool & GP Education. total annual EMR costs[Funding level]	(Annual Code mtce+ EMR FF)*EMR Off\\On
E-decision support tool & GP Education.Year to full GP uptake	3
E-decision support tool & GP Education.Year to Start EMR	2020
E-decision support tool & GP Education.Year to Start GP Education	2020
E-decision support tool & GP Education.Years to Roll out updates	1
E-decision support tool & GP Education.Years to Visit all GPs	1

Model Variable	Values
Exercise vouchers."% cost covered by the state"	0
Exercise vouchers."% of population 50+with effect"[Gender]	IF Voucher Off\On= 1 AND TIME > Year to Start Voucher Program THEN (Total users with effect/SUM(.Population array[Gender,A54:A104]))*100 ELSE 0
Exercise vouchers.Active Voucher users[Gender]	IF TIME<=Voucher program end year THEN Total ppl on Voucher Program ELSE 0
Exercise vouchers.Annual loss rate % pa	20
Exercise vouchers.Annual running admin and program costs[Federal]	2220000
Exercise vouchers.Annual running admin and program costs[State]	0
Exercise vouchers.Annual running admin and program costs[OOP]	0
Exercise vouchers.annual voucher program cost[Federal]	SUM(Voucher expenditures pa[*],Federal))
Exercise vouchers.annual voucher program cost[State]	SUM(Voucher expenditures pa[*],State))
Exercise vouchers.annual voucher program cost[OOP]	SUM(Voucher expenditures pa[*],OOP))
Exercise vouchers.annual web register costs[Funding level]	inc website costs
Exercise vouchers.Annual website mtce[Funding level]	IF TIME> Year to Start website+ Time to design and launch THEN Annual running admin and program costs ELSE 0
Exercise vouchers.ASV Program years[ASVY, Gender](t)	ASV Program years[ASVY,Gender](t-dt)+ (voucher users this year[ASVY,Gender]-continuing next year[ASVY,Gender]-dropping out this year[ASVY,Gender])*dt
INIT Exercise vouchers.ASV Program years[ASVY, Gender]	0
TRANSIT TIME	1
CAPACITY	INF
INFLOW LIMIT	INF
Exercise vouchers.continuing next year[ASVY, Gender]	CONVEYOROUTFLOW
Exercise vouchers.Cost per voucher[Federal]	100
Exercise vouchers.Cost per voucher[State]	0
Exercise vouchers.Cost per voucher[OOP]	888
Exercise vouchers.dropping out this year[ASVY, Gender]	LEAKAGEOUTFLOW

Model Variable	Values
LEAKAGE FRACTION	Annual loss rate % pa/100
Exercise vouchers.effect modifier exercise program	-23
Exercise vouchers.Elapsed Voucher time %	(TIME-Year to Start Voucher Program)/Years to Max Take up*100*Voucher Off\\On
Exercise vouchers.Exercise register website FF[Funding level]	IF TIME>= Year to Start website AND TIME <(Year to Start website+ Time to design and launch) THEN Flag Fall \$ ELSE 0
Exercise vouchers.Flag Fall \$[Fed]	960000
Exercise vouchers.Flag Fall \$[Sta]	0
Exercise vouchers.Flag Fall \$[OOP]	0
Exercise vouchers.Flow 1[Funding level]	total exercise intervention costs per year
Exercise vouchers.inc voucher cost[Funding level]	annual voucher program cost[Funding level]
Exercise vouchers.inc website costs[Federal]	total annual website costs*(1-(% cost covered by the state/100))
Exercise vouchers.inc website costs[State]	total annual website costs*(% cost covered by the state/100)
Exercise vouchers.inc website costs[OOP]	0
Exercise vouchers.length of residual effect from exercise	1
Exercise vouchers.Length of Voucher Program	5
Exercise vouchers.Max Voucher Take up %[M]	5
Exercise vouchers.Max Voucher Take up %[F]	5
Exercise vouchers.N lower	RANK(Lower age limit for voucher,21)
Exercise vouchers.N upper	RANK(Upper age limit for voucher,21)
Exercise vouchers.new starts[Gender]	IF TIME<Voucher program end year THEN (Population using Vouchers-Total ppl on Voucher Program)/DT ELSE 0
Exercise vouchers.Population in Range eligible for voucher[Gender]	SUM(.Population array[Gender,N lower:N upper])
Exercise vouchers.Population using Vouchers[Gender]	Population in Range eligible for voucher*Max Voucher Take up %/100*Voucher Take up Shape/100
Exercise vouchers.Ppl stopping voucher[Gender]	IF TIME<Voucher program end year THEN Total ppl on Voucher Program*(Annual loss rate % pa/100) ELSE IF TIME = Voucher program end year THEN Total ppl on Voucher Program/DT ELSE 0
Exercise vouchers.recycle[ASVY, Gender]	IF ASVY= 1 OR TIME >=Voucher program end year THEN 0 ELSE continuing next year[ASVY-1, Gender]
Exercise vouchers.residual voucher users[Gender]	Voucher residual effect
Exercise vouchers.Time to design and launch	1

Model Variable	Values
Exercise vouchers.total annual website costs[Funding level]	IF Voucher Off\On = 1 AND TIME<Voucher program end year THEN (Annual website mtce+ Exercise register website FF) ELSE 0
Exercise vouchers.total exercise intervention costs per year[Funding level]	(annual voucher program cost[Funding level]+ annual web register costs[Funding level])*inflation modifier*.NPV factor
Exercise vouchers.Total ppl on Voucher Program[M](t)	Total ppl on Voucher Program[M](t-dt)+ (new starts[M]-Ppl stopping voucher[M])*dt
INIT Exercise vouchers.Total ppl on Voucher Program[M]	0
Exercise vouchers.Total ppl on Voucher Program[F](t)	Total ppl on Voucher Program[F](t-dt)+ (new starts[F]-Ppl stopping voucher[F])*dt
INIT Exercise vouchers.Total ppl on Voucher Program[F]	0
Exercise vouchers.Total users with effect[Gender]	Active Voucher users+ residual voucher users
Exercise vouchers.Voucher expenditures pa[Gender, Funding level]	IF TIME<= Voucher program end year AND "Voucher Off\On" = 1 THEN SUM(voucher users this year[* , Gender])*(Cost per voucher[Funding level]*(1+ (Voucher admin overhead per voucher/100))) ELSE 0
Exercise vouchers."Voucher Off\On"	0
Exercise vouchers.Voucher program end year	Year to Start Voucher Program+ Length of Voucher Program
Exercise vouchers.Voucher residual effect[M](t)	Voucher residual effect[M](t-dt)+ (Ppl stopping voucher[M]-waning effect[M])*dt
INIT Exercise vouchers.Voucher residual effect[M]	0
TRANSIT TIME	length of residual effect from exercise
CAPACITY	INF
INFLOW LIMIT	INF
Exercise vouchers.Voucher residual effect[F](t)	Voucher residual effect[F](t-dt)+ (Ppl stopping voucher[F]-waning effect[F])*dt
INIT Exercise vouchers.Voucher residual effect[F]	0
TRANSIT TIME	length of residual effect from exercise
CAPACITY	INF
INFLOW LIMIT	INF
Exercise vouchers.Voucher Take up Shape	GRAPH(Elapsed Voucher time %)(0.0, 0.0), (10.0, 14.9), (20.0, 37.3), (30.0, 69.7), (40.0, 73.2), (50.0, 75.4), (60.0, 77.2), (70.0, 82.0), (80.0, 93.4), (90.0, 97.8), (100.0, 100.0)
Exercise vouchers.voucher users this year[ASVY, Gender]	IF ASVY = 1 THEN new starts[Gender] ELSE recycle
Exercise vouchers.Voucher users x check[Gender]	SUM(ASV Program years[* , Gender])
Exercise vouchers.waning effect[Gender]	CONVEYOROUTFLOW

Model Variable	Values
Exercise vouchers.Website Costs[Federal](t)	Website Costs[Federal](t-dt)+ (inc website costs[Federal])*dt
INIT Exercise vouchers.Website Costs[Federal]	0
Exercise vouchers.Website Costs[State](t)	Website Costs[State](t-dt)+ (inc website costs[State])*dt
INIT Exercise vouchers.Website Costs[State]	0
Exercise vouchers.Website Costs[OOP](t)	Website Costs[OOP](t-dt)+ (inc website costs[OOP])*dt
INIT Exercise vouchers.Website Costs[OOP]	0
Exercise vouchers.Year to Start Voucher Program	2020
Exercise vouchers.Year to Start website	2020
Exercise vouchers.Years to Max Take up	3
NRIAP screening,"% in normal category who are an age who qualify"[M]	7.7
NRIAP screening,"% in normal category who are an age who qualify"[F]	3.4
NRIAP screening,"% in osteopenia category who are of an age that qualifies"[M]	26.3*0.9
NRIAP screening,"% in osteopenia category who are of an age that qualifies"[F]	20.9*0.9
NRIAP screening,"% in osteoporosis category who are an age that qualifies"[M]	55.5*0.75
NRIAP screening,"% in osteoporosis category who are an age that qualifies"[F]	61.0*0.75
NRIAP screening,"% of eligible population covered"	IF NRIAP on/off = 1 THEN Effective PHNs/31*100 ELSE 0
NRIAP screening,"% of eligible population included in intervention"	100
NRIAP screening.Annual cost post pilot stage[Federal]	3700000/10
NRIAP screening.Annual cost post pilot stage[State]	0
NRIAP screening.Annual cost post pilot stage[OOP]	0
NRIAP screening.Annual NRIAP total cost[Funding level]	IF NRIAP on/off = 0 THEN 0 ELSE IF TIME >=starting year AND TIME<(starting year+ 1) THEN Pilot cost year 1 ELSE IF TIME >= starting year+ 1 AND TIME<(starting year+ 2) THEN Pilot cost year 2 ELSE IF TIME >= starting year+ 2 THEN Annual cost post pilot stage ELSE 0
NRIAP screening.Effective PHNs	Effective Pilot PHNs*Pilot take up Shape/100+ Effective roll out PHNs
NRIAP screening.Effective Pilot PHNs	4

Model Variable	Values
NRIAP screening.Effective roll out PHNs	Roll out PHNs*(Roll Out Progression/100)
NRIAP screening.inc NRIAP registry cost[Funding level]	Annual NRIAP total cost*.NPV factor*.inflation modifier
NRIAP screening.new diagnosis through program	New osteoporosis diagnosis
NRIAP screening.New osteoporosis diagnosis	SUM(ppl with osteoporosis tested through NRIAP)+ SUM(ppl with Sentinel other fx tested through NRIAP)+ SUM(ppl with Sentinel hip fx tested through NRIAP)
NRIAP screening."NRIAP on/off"	0
NRIAP screening.NRIAP participation rate[M]	37
NRIAP screening.NRIAP participation rate[F]	42
NRIAP screening.people screened per year	Total screened pa
NRIAP screening.Pilot cost year 1[Federal]	2700000
NRIAP screening.Pilot cost year 1[State]	0
NRIAP screening.Pilot cost year 1[OOP]	0
NRIAP screening.Pilot cost year 2[Federal]	1800000
NRIAP screening.Pilot cost year 2[State]	0
NRIAP screening.Pilot cost year 2[OOP]	0
NRIAP screening.Pilot Length	2
NRIAP screening.Pilot take up Shape	GRAPH((TIME-starting year)/Pilot Length*100) (0.0, 0.0), (10.0, 0.0), (20.0, 3.9), (30.0, 11.4), (40.0, 30.3), (50.0, 62.3), (60.0, 87.3), (70.0, 98.2), (80.0, 100.0), (90.0, 100.0), (100.0, 100.0)
NRIAP screening.ppl with normal BMD tested through NRIAP pa[Gender]	IF TIME<starting year THEN 0 ELSE IF TIME = starting year THEN PULSE((.ppl with normal bones by BMD* (% in normal category who are an age who qualify/100)*(% of eligible population covered/100)* (NRIAP participation rate/100)*DT))+ (.tuning 50 rate*(% in normal category who are an age who qualify/100)* (% of eligible population covered/100)*(NRIAP participation rate/100)) ELSE PULSE(((.ppl with normal bones by BMD*(% in normal category who are an age who qualify/100)* ((% of eligible population covered-HISTORY(% of eligible population covered, TIME-1))/100)*(NRIAP participation rate/100)*DT))+ (.tuning 50 rate*(% in normal category who are an age who qualify/100)*(% of eligible population covered/100)*(NRIAP participation rate/100)))
NRIAP screening.ppl with osteopenia tested through NRIAP[Gender]	IF TIME<starting year THEN 0 ELSE IF TIME = starting year THEN PULSE((.ppl with osteopenia without PP*(% in osteopenia category who are of an age that qualifies/100)*(% of eligible population covered/100)*(NRIAP participation rate/100)*DT)) ELSE PULSE(((.ppl with osteopenia without PP*(% in osteopenia category who are of an age that qualifies/100)*(% of eligible population covered-HISTORY(% of eligible population covered, TIME-1))/100)*(NRIAP participation rate/100)*DT)) + (.ppl developing impaired bone health rate*(% in osteopenia category who are of an age that qualifies/100)*(% of eligible population covered/100)*(NRIAP participation rate/100)))

Model Variable	Values
NRIAP screening.ppl with osteoporosis tested through NRIAP[Gender]	IF TIME<starting year THEN 0 ELSE IF TIME = starting year THEN PULSE((.ppl with osteoporosis without meds* (% in osteoporosis category who are an age that qualifies/100)* (% of eligible population covered/100)* (NRIAP participation rate/100)*DT)) ELSE PULSE(((.ppl with osteoporosis without meds* (% in osteoporosis category who are an age that qualifies/100) *((% of eligible population covered-HISTORY(% of eligible population covered, TIME-1))/100)* (NRIAP participation rate/100)*DT))+ (.ppl developing osteoporosis rate* (% in osteoporosis category who are an age that qualifies/100)*(% of eligible population covered/100)*(NRIAP participation rate/100)))
NRIAP screening.ppl with Sentinel hip fx tested through NRIAP[Gender]	IF TIME<starting year THEN 0 ELSE IF TIME = starting year THEN PULSE((.ppl with sentinel hip fx (without meds)* (% in osteoporosis category who are an age that qualifies/100)* (% of eligible population covered/100)*(NRIAP participation rate/100)*DT)) ELSE PULSE(((.ppl with sentinel hip fx (without meds)* (% in osteoporosis category who are an age that qualifies/100)* ((% of eligible population covered-HISTORY(% of eligible population covered, TIME-1))/100)*(NRIAP participation rate/100)*DT))+ ((.Sentinel hip fx rate without meds+ .other fx to hip fx rate (without meds))* % in osteoporosis category who are an age that qualifies/100)* (% of eligible population covered/100)* (NRIAP participation rate/100)))
NRIAP screening.ppl with Sentinel other fx tested through NRIAP[Gender]	IF TIME<starting year THEN 0 ELSE IF TIME = starting year THEN PULSE((.ppl with sentinel other fx (without meds) *(% in osteoporosis category who are an age that qualifies/100)* (% of eligible population covered/100)*(NRIAP participation rate/100)*DT)) ELSE PULSE(((.ppl with sentinel other fx (without meds)*(% in osteoporosis category who are an age that qualifies/100)*((% of eligible population covered-HISTORY(% of eligible population covered, TIME-1))/100)*(NRIAP participation rate/100)*DT)) + (.sentinel other fx rate (without meds)* (% in osteoporosis category who are an age that qualifies/100) *(% of eligible population covered/100)*(NRIAP participation rate/100)))
NRIAP screening.Roll Out length	5
NRIAP screening.Roll out PHNs	31-Effective Pilot PHNs
NRIAP screening.Roll Out Progression	GRAPH((TIME-Roll Out Start Year)/Roll Out length*100)
(0.0, 0.0), (20.0, 18.5), (40.0, 40.7), (60.0, 62.92), (80.0, 85.14), (100.0, 100.0)	
NRIAP screening.Roll Out Start Year	starting year+ Pilot Length
NRIAP screening.starting year	2019
NRIAP screening.Total screened pa	SUM(ppl with normal BMD tested through NRIAP pa)+ SUM(ppl with osteopenia tested through NRIAP)+ SUM(ppl with osteoporosis tested through NRIAP)+ SUM(ppl with Sentinel other fx tested through NRIAP)+ SUM(ppl with Sentinel hip fx tested through NRIAP)
NRIAP screening.total screenings under NRIAP program(t)	total screenings under NRIAP program(t-dt)+ (people screened per year)*dt
INIT NRIAP screening.total screenings under NRIAP program	0
Vitamin D in RACF."% coverage RAC Vitamin D"	IF Switch ON/OFF = 1 AND TIME <= Intervention End Year THEN % RACF residents on Vit D in base case+ (Target % population coverage*(Roll Out Progression/100)) ELSE % RACF residents on Vit D in base case

Model Variable	Values
Vitamin D in RACF."% RACF residents on Vit D in base case"	47.1
Vitamin D in RACF.Annual Vitamin D intervention expenditures[Funding level]	(SUM(PPL in RACF on Vitamin D intervention[*])*Vitamin D Intervention Unit Cost per person pa[Funding level])*NPV factor*.inflation modifier
Vitamin D in RACF.Annual Vitamin D intervention expenditures over study period[Funding level]	Annual Vitamin D intervention expenditures
Vitamin D in RACF.Intervention End Year	2031
Vitamin D in RACF.PPL in RACF on Vitamin D intervention[Gender]	.ppl in aged care*((% coverage RAC Vitamin D-% RACF residents on Vit D in base case)/100)
Vitamin D in RACF.RAC vitamin D fall rate modifier	-28
Vitamin D in RACF.Roll Out length	5
Vitamin D in RACF.Roll Out Progression	GRAPH((TIME-Roll Out Start Year)/Roll Out length*100) (0.0, 0.0), (10.0, 2.55), (20.0, 10.5), (30.0, 19.4), (40.0, 34.1), (50.0, 51.0), (60.0, 70.7), (70.0, 80.9), (80.0, 87.6), (90.0, 88.9), (100.0, 89.5)
Vitamin D in RACF.Roll Out Start Year	2020
Vitamin D in RACF."Switch ON/OFF"	0
Vitamin D in RACF.Target % population coverage	13
Vitamin D in RACF.Vitamin D Intervention Unit Cost per person pa[Federal]	45/4
Vitamin D in RACF.Vitamin D Intervention Unit Cost per person pa[State]	0
Vitamin D in RACF.Vitamin D Intervention Unit Cost per person pa[OOP]	30

BMD: bone mineral density; CC: community care; DALY: Disability adjusted life years lost; DRG: diagnosis related group; DXA: dual energy x-ray absorptiometry; ED: emergency department; E-decision: electronic decision; EMR: electronic medical record; FLS: fracture liaison service; fx: fracture; GP: general practitioner; HH: home help; med: medication; MOW: meals on wheels; MT: minimal trauma; NPV: net present value; NRIAP: National risk identification awareness program; OOP: out of pocket; OGS: orthogeriatric service; pa: per annum; PHN: primary health network; physio: physiotherapy; PP: primary prevention; ppl: people; pre fx: prior to fracture; post fx: after fracture; RAC: residential aged care; RACF: residential aged care facility; rehab: rehabilitation; SMC: social marketing campaign; SFPP: secondary fracture prevention program; URG: urgency related group; vert: vertebral; YLD: years of life lost to disability

Table 2, Model assumptions

Sector	Assumptions	Evidence / rationale
A. Population sector	Population aged over 50 years, including immigration / emigration, birth and death rates.	Data from the Australian Bureau of Statistics.(1)
B. Pre-fracture bone health sector	All people have normal BMD at age 50 years	Model assumption for simplification - deemed reasonable by expert group.
	Proportion of people over 50 years who develop osteopenia and / or osteoporosis	(2)
	All treated patients were assumed to be treated with denosumab.	In 2018, denosumab accounted for 76.1% of all patients dispensed any osteoporosis medicine.(3)
	Relative risk of fracture when treated with osteoporosis medication is 0.6 for hip fractures, 0.3 for vertebral fractures, and 0.8 for non-hip non-vertebral fractures.	Meta-analyses suggest that the effect on fracture outcomes of different classes of medications are not significantly different. Effect of the most widely used class denosumab was selected as a proxy for effect of all osteoporosis medication.(4, 5)
C. Fracture status sector	Fracture occurs at any BMD value, but risk of fracture is higher in those with osteopenia, and higher still in those with osteoporosis.	(6)
D. Falls and fractures sector	Incidence rates of falling	(7)
	100% of hip fractures, 30% of vertebral fractures, and 100% of non-hip non-vertebral fractures are caused by falls	Estimates deemed reasonable by expert group and sensitivity/uncertainty analysis did not show significant change to model findings with varying the parameter input of $\pm 10\%$.
E. Hospital care sector	The capacity of FLS and orthogeriatric services will be filled as long as the number of referrals exceeds the capacity. Currently each FLS and orthogeriatric service are at full capacity of treating 40 patients with any fractures and 11 patients with hip fractures per month, respectively	Unpublished data from evaluation of current programs.

Sector	Assumptions	Evidence / rationale
	100 % of hip fractures, 85 % of vertebral fractures, and 85 % of non-hip non-vertebral fractures present to hospitals; of these 100 % of hip fractures, 50 % of vertebral fractures, and 70 % of non-hip non-vertebral fractures are admitted.	(2, 8)
F. Pre- and post-fracture community care sectors	Frequency of attendance at GP for people aged over 50 years.	Model assumption for simplification - deemed reasonable by expert group.
	90 % of people referred to their GP from hospital after fracture will see their GP. Those with medication initiated in hospital will have their treatment maintained, whereas those referred to GP for treatment initiation (with a recommendation from orthogeriatric or FLS) have a probability of 50 % of receiving treatment.	Model assumption for simplification - deemed reasonable by expert group.
	DXA scan has been increasingly used in those over 70 years since funded. It is assumed we have reached a natural limit by the end of 2018 (i.e. no further increase without a structured program)	Model assumption for simplification - deemed reasonable by expert group.
	40 % of newly-medicated patients temporarily lapse, and 50 % of them restart the medication in the first year. 10 % of medication users stop the medication every year. 10 % of medication users do not take the full dose as instructed.	(2)
	Osteoporosis medications have no residual effects on the risk of fractures after a patient stop the medication.	It is recognised that bisphosphonates have residual effect, but currently only a minority of Australian population (~25 %) use them and the compliance and persistence are low.(3)

Sector	Assumptions	Evidence / rationale
G. Cost and burden of disease sector	Only cost incurred in people with known osteopenia, osteoporosis, and fractures are accounted for (i.e. those with undiagnosed conditions incur no additional health services use cost)	Model assumption for simplification - deemed reasonable by expert group.
	Fracture-related cost incurred in hospitals include: DRG 103A (for hip fractures), DRG 179A (for other fractures), ambulance, rehabilitation.	Advised by health economists.
	GP visits per person per year for various groups: - Osteopenia: 2 for DXA scan/diagnosis - Osteoporosis defined by BMD: 2 for DXA scan/diagnosis + 2 for medication scripts - Minimal trauma fracture presenting to GPs: 3 for diagnosis + 2 for medication scripts - Minimal trauma fracture after hospitalisation: 1 for referral from hospitals + 2 for medication scripts	Model assumption for simplification as advised by health economists.
	Pathology test per person with osteoporosis medication: - full bloodwork panel on treatment initiation (except for those initiated in hospitals which is covered under DRG) - renal function and serum calcium twice per year (item 66506) - vitamin D once every two years (item 66933)	(2)
	Effect and cost of osteoporosis medication are modelled according to their current market share. The annual cost is expected to be lower by 15% in 5 years with change in patent, price, and market share. Scenarios where new medication is commercialised and used is not modelled.	Model assumption for simplification as advised by health economists.

Sector	Assumptions	Evidence / rationale
	Only hip fractures contribute to Years Life Lost. Disability weight is applied to people living after sustaining any fracture (i.e. prevalence rather than incidence).	It is recognised that fragility fractures are associated with increased mortality and the model has accounted for that with calibration factors. Literature only identified independent causal relationship between death and hip fractures (i.e. people die within a year <i>because of</i> hip fractures after confounders such as age and frailty are adjusted for), which contributes to Years Life Lost. (9)
H. FLS intervention	Duration of roll-out of new services 10 years. Capacity of each FLS is 40 new patients per month. Screening rate of FLS is 30%. Failure to attend rate of 30%.	Model assumption for simplification - deemed reasonable by expert group.

BMD: bone mineral density; DRG: diagnosis-related group; DXA: Dual X-ray absorptiometry; FLS: fracture liaison service; GP: general practitioner;

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