Cost-Effectiveness Analysis of Fracture Prevention with 25-Hydroxyvitamin D (25(OH)D) Screening Among the Population over 65 Years Old in China

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BACKGROUND

- Vitamin D deficiency is associated with an increased risk of fractures, particularly in the elderly population. Serum 25(OH)D is currently regarded as the most reliable indicator of vitamin D status. Supplementation with vitamin D and calcium has the potential to decrease fracture risk in individuals with vitamin D deficiency.

OBJECTIVE

- The objective of this study is to evaluate the cost-effectiveness of the 25(OH)D screening strategy compared to non-screening for the prevention of fracture from the societal perspective among the population over 65 years old in China.

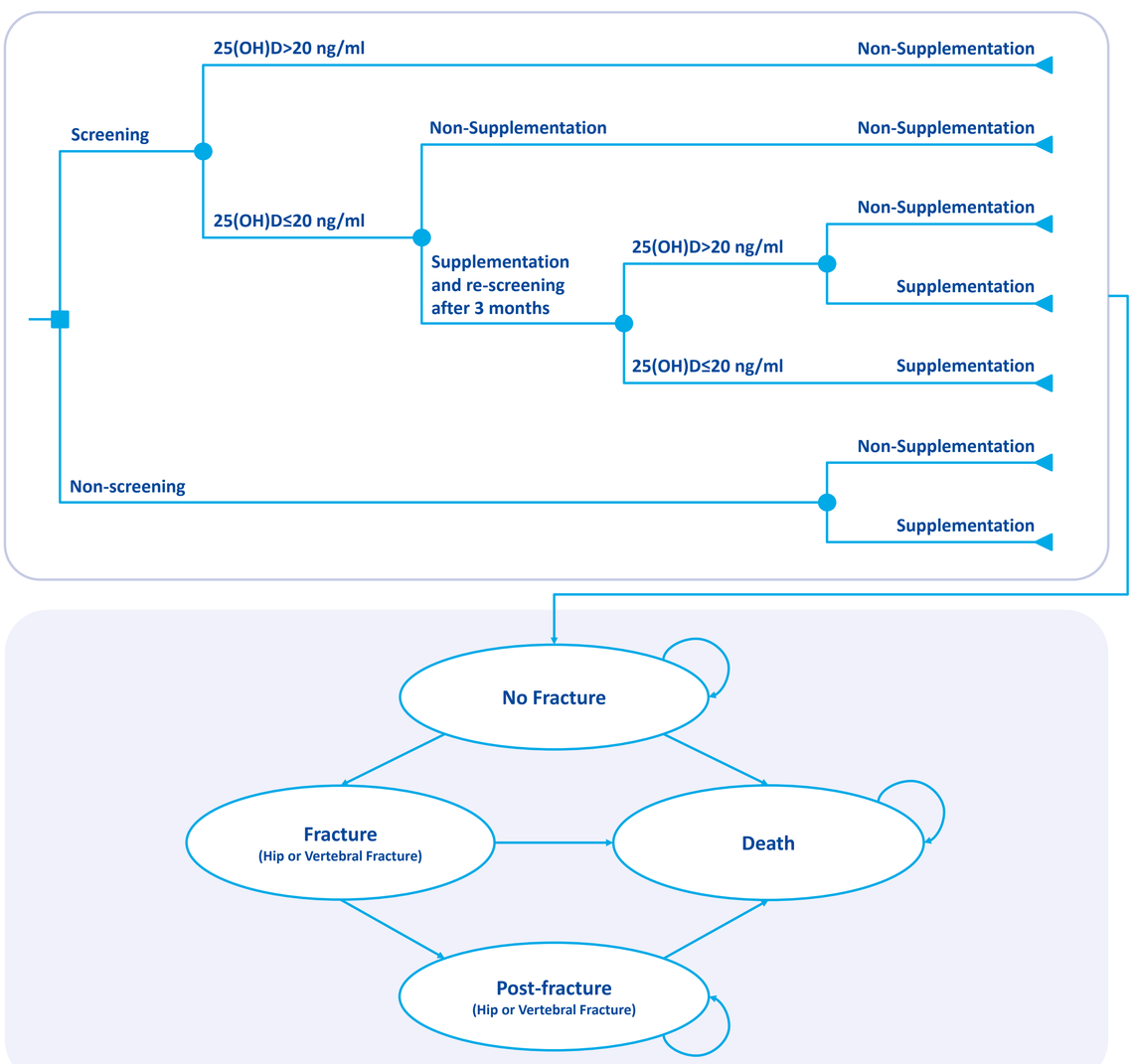
METHOD

- A decision tree and Markov model were combined to estimate lifetime costs and quality-adjusted life years (QALYs) for screening and non-screening strategies (with or without vitamin D and calcium supplementation).
- The effectiveness of vitamin D and calcium supplementation in reducing fracture risk was derived from the published meta-analysis [1-4].
- The proportion of the population who would take the supplements and the dosage of supplement was obtained through in-depth interviews.

Strategy		Dosage of supplement
Screening	25(OH)D>20 ng/ml	800IU VD + 600mg Ca /day
	25(OH)D≤20 ng/ml	1000IU VD + 600mg Ca /day
Non-screening		800IU VD + 600mg Ca /day

- Epidemiologic, clinical, and cost data were collected from published literature or public databases [5-9].
- Uncertainties regarding key parameters were evaluated using deterministic and probabilistic sensitivity analyses.
- Scenario analysis was conducted to evaluate the cost-effectiveness of screening for different population or different screening strategies.

Figure 1 Model structure



Key Assumptions

- Accuracy of screening is 100%.
- In the screening group, patients need to be rescreened after 3 months of supplementation to detect changes in 25(OH)D levels.
- The supplementary dose for the non-screening group was equivalent to the screening group's minimal dose.
- The adherence of patients who takes supplements is 80% [10].
- Regardless of supplement dose, supplementation lowers the risk of fractures by the same percentage.
- The 25(OH)D level will be maintained throughout life when the deficient population take no supplementation.
- Patients only experience one fracture event in lifetime, instead of multiple fracture events.

RESULTS

Base case

- Compared to the non-screening strategy, the screening strategy provides 0.014 incremental QALY.
- The lifetime costs per person were lower for the screening strategy at ¥13,154 compared with ¥13,351 for the non-screening strategy, which is a saving of ¥197 with ICER of ¥-14,281.5 per QALY gained.

Table 1 | Base case results

Strategy	Costs	QALYs	Incremental Cost	Incremental QALY	ICER
Screening	¥13,154	7.842	¥-197	0.014	**¥-14,281.5**
Non-screening	¥13,351	7.828			

Sensitivity analyses

- Both one-way and probabilistic sensitivity analysis confirmed the robustness of the results.

Figure 2 One-way sensitivity analysis

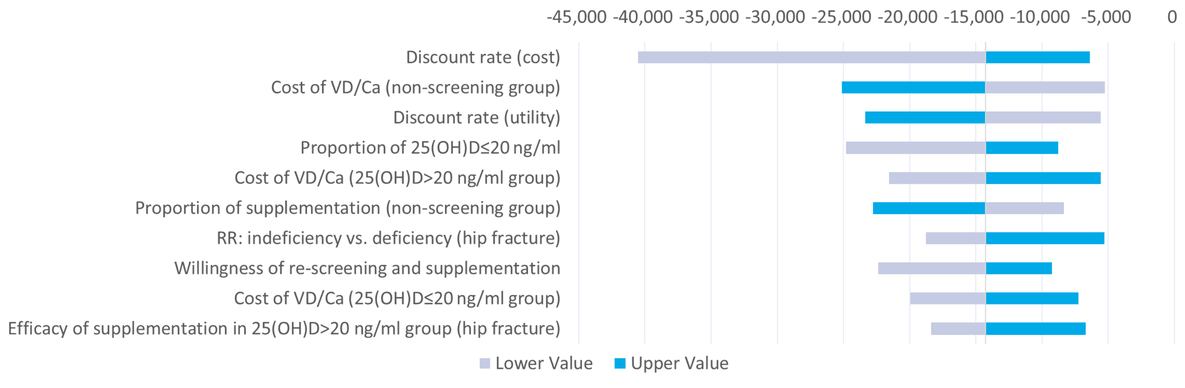
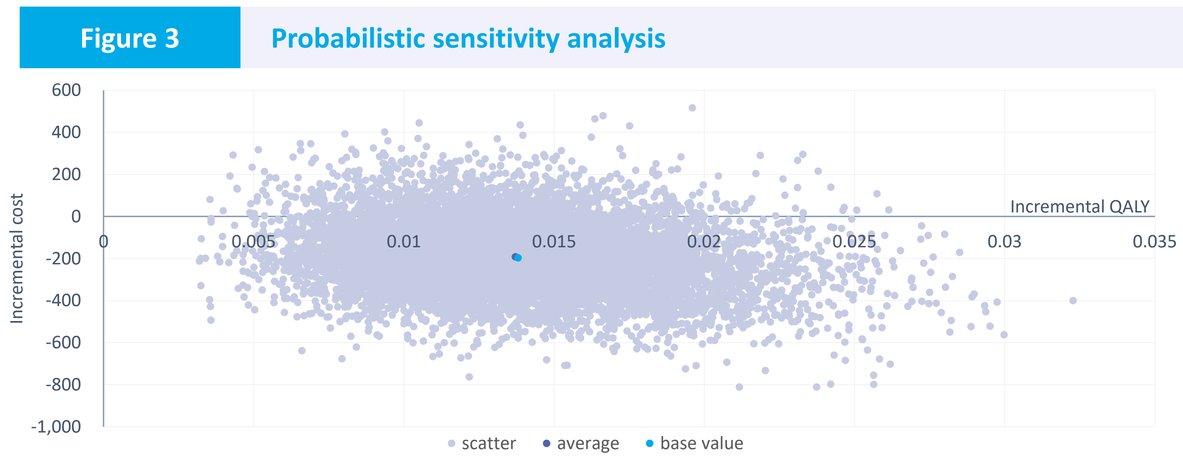


Figure 3 Probabilistic sensitivity analysis



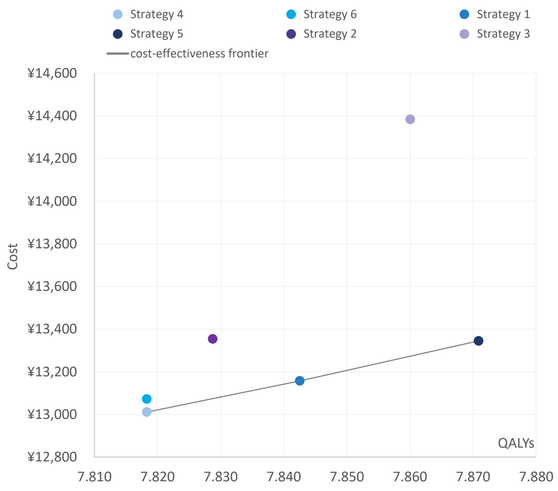
Scenario 1. Women over 50 years old

- The lifetime costs per person were lower for the screening strategy at ¥13,792.2 compared with ¥13,854.9 for the non-screening strategy, which is a saving of ¥62.7 with ICER of ¥-6,455.77 per QALY gained.

Scenario 2. Different screening strategies

- When the WTP is one-time GDP per capita, compare to strategy 4, the strategy 1, 5 is cost-effective.

No.	Strategy	Cost	QALYs	ICER
4	Non screening and no supplementation	¥13,010.91	7.818	
6	Screening, then the deficient all take no supplementation	¥13,071.73	7.818	dominated
1	Screening, then with/without supplementation	¥13,157.06	7.843	¥6,028.83
5	Screening, then the deficient all take supplementation	¥13,344.59	7.871	¥6,613.90
2	No screening, then with/without supplementation	¥13,354.23	7.829	dominated
3	No screening, but all take supplementation	¥14,384.18	7.860	dominated



CONCLUSIONS

- Compared to the non-screening strategy, population-based 25(OH)D screening was projected to be cost-saving, with increased QALY gains for primary prevention of fractures among the population over 65 years old in China.

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