Summary of Findings

This background paper assesses the costs and effectiveness of screening women for bone density once, at the time of menopause (age 50) or alternatively at age 65, and placing those with low bone density on long-term hormonal replacement therapy (HRT).

Based on a review of the literature, OTA made assumptions about the major adverse health events affected by HRT: hip fracture, coronary heart disease, breast cancer, endometrial cancer and gallbladder disease. The base-case assumptions represent OTA's judgments about the most likely level of effects. OTA also looked at the effect of best-case assumptions (those most favorable to osteoporosis screening and HRT) and worst-case assumptions (those least favorable to osteoporosis screening and HRT) on the estimated cost effectiveness of screening and HRT.

OTA's estimates include the costs (or savings) of hospital care, nursing home care, and other long-term care due to disease-related disabilities as well as the costs of screening and HRT. OTA did not include the cost of unpaid care provided by family and friends.

Because evidence on the quality of life associated with HRT and the diseases affected by it is scanty and even nonexistent for some conditions, OTA estimated HRT's impacts only on the length of life, not on its quality. Yet, HRT may have a major impact on quality of life through its short-term side effects and relief of menopausal symptoms and its long-term impact on fractures, heart disease, breast cancer, and endometrial cancer. Many elderly women with hip fractures, for example, never regain full function or independence. This summary identifies the conditions

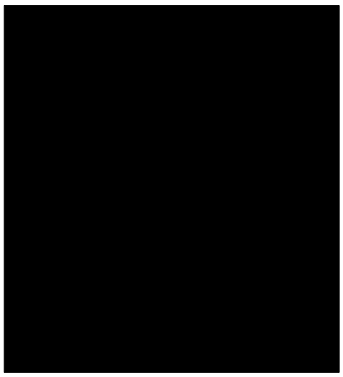

TABLE A: Principal Effects of Hormone Replacement Therapy

	ERT		PERT	
	Base case assumptions	Direction of effect[a]	Base case assumptions	Direction of effect[a]
Reduction in bone loss while on therapy	1OO%	+	1OO%	+
RR of heart disease while on therapy	0.5	+	0.8	+
RR of breast cancer after long-term therapy	1,35		1.35	—
RR of endometrial cancer after long-term therapy	7.0		1.0	0
RR of gallbladder disease while on therapy	2.5		2,5	—

[a]Indicates whether the base case assumption does (+) or does not (-) Improve the cost-effectiveness ratios of the screening/ttreatment regimens
KEY: ERT = estrogen replacement therapy, PERT = progestin/estrogen replacement therapy, RR = relative risk

SOURCE Off ice of Technology Assessment, 1995

under which quality of life considerations could alter judgments about the most appropriate screening/HRT strategy.

HRT regimens consist either of estrogen given alone (ERT) or estrogen given in combination with a progestin (PERT). Evidence is strong that ERT retards the rate of bone loss and reduces the risk of hip fracture, but it also increases the incidence of endometrial cancer. Suggestive evidence also exists for a reduced risk of coronary heart disease and an elevated risk of breast cancer and gallbladder disease in women on ERT for extended periods of time. PERT eliminates the excess risk of endometrial cancer, but it may also reduce the heart disease benefits associated with ERT. OTA's base case assumptions regarding the impact of ERT and PERT on each disease are shown in table A.

OTA examined a number of screening/HRT strategies, defined by the age at which bone mineral density (BMD) measurement occurs, the BMD threshold for initiation of a course of long-term HRT, and the duration of therapy. The screening/HRT strategies examined are listed in table B.

OTA's cost-effectiveness analysis can be used to guide overall public health policy, including decisions about educational programs or payment for screening or HRT, but it is not intended to guide individual decisions regarding BMD screening or long-term HRT. Individual women's risks of the various conditions and diseases affected by HRT vary, as do their assessments of the quality-of-life implications of various outcomes.

The findings of OTA's cost-effectiveness analysis are summarized below:

- Given base case assumptions, screening women for osteoporosis at menopause and placing those with low bone density on long-term ERT would deliver an additional year of life for about $27,000, which is a reasonable cost per added year of life compared with many interventions currently paid for by public and private third-party payers.
- Given base case assumptions, placing all women on long-term ERT at menopause, without screening for bone density, would deliver an additional year of life for about the same amount, roughly $23,000.
- Although the cost per added year of life is about the same for these two preventive strategies, their aggregate costs and benefits differ. The aggregate cost of the latter approach is higher than the former because more women are treated, and the aggregate benefits are also higher because more lives are saved (about 11,000 years of life per 100,000 women entered in the program vs. about 1,800 years of life per 100,000 women, respectively).

TABLE B: BMD Screening/HRT Strategies Considered by OTA

Age at which BMD measurement occurs:
▪ 50 years old
▪ 65 years old
BMD threshold for initiating a course of therapy:
▪ **BMD** 1 standard deviation below the mean
▪ BMD below the mean of the population
▪ Offer HRT to all women (no BMD screening)
Duration of therapy:
▪ 10 years
▪ 20 years
▪ 30 years
▪ 40 years

KEY: BMD = bone mineral density; HRT = hormone replacement therapy,

SOURCE Off ice of Technology Assessment, 1995.

- Regardless of the screening/treatment strategy chosen, the cost per added year of life declines dramatically with the duration of ERT, so that a lifelong course of therapy delivers the greatest benefit per dollar spent. Shorter durations of HRT—10 to 20 years-are less cost-effective than are longer treatment durations, largely because substantial medical benefits accrue only when women stay on the therapy into old age, when hip fractures and heart disease would rise dramatically. OTA's model suggests that 10 years of HRT is extremely costly regardless of whether or how HRT is targeted.
- OTA's estimated cost-effectiveness ratios are most sensitive to assumptions about the effect of ERT on heart disease. In the base case, OTA assumed the existence of a substantial reduction in heart disease with ERT. This assumption may be incorrect because the evidence of heart disease benefits from ERT is based on observational studies, which may be biased. *If ERT has no heart disease benefit,* the cost per added year of life for all screening/ERT strategies would be high. In this circumstance, putting all women on a lifetime course of ERT would cost roughly $450,000 per added year of life. Screening women for osteoporosis at menopause and placing those with low bone density on long-term ERT would cost less—roughly $155,000 per added year of life—but it is substantially more costly per added year of life than are most preventive technologies currently accepted for Medicare payment.
- If ERT has no heart disease benefits, the quality-adjusted cost-effectiveness ratio of screening and long-term ERT for those with low bone density would depend on the improvement in quality of life from fewer fractures compared with the decline in quality of life from increased risks of breast and endometrial cancer. The impact on quality of life from fracture incidence reduction would occur relatively late in life, because most fractures occur in the very old, whereas the quality of life impacts of increased cancer incidence would occur earlier in life. Depending on the value people place on these impacts, the quality-adjusted cost-effectiveness ratio could be either higher or lower than the unadjusted cost-effectiveness ratio given above.
- Current practice is to prescribe PERT for long-term therapy. Although PERT clearly eliminates the excess risk of endometrial cancer, it may also reduce the magnitude of heart disease benefits obtained from ERT. Clinical trials have demonstrated that the addition of progestins reverses some or all of ERT's favorable effects on lipoproteins. Under OTA's base case assumption that PERT has a small but significant effect on heart disease benefit of PERT, placing all women on long-term PERT would cost roughly $71,000 per added year of life. Placing only those with low bone density on long-term PERT would cost about the same amount per added year of life.
- If PERT has no heart disease benefit, the cost per added year of life is very high for *all* screening and treatment strategies. For example, the cost of putting all women on PERT would be about $262,000 per added year of life. Quality-

of-life adjustments could change this ratio, but the magnitude and direction of the change cannot be predicted with currently available evidence.

- OTA considered including the cost of vertebral and other fractures associated with osteoporosis in the analysis, and did not do so. Good estimates of the health care costs associated with these fractures are unavailable. As discussed in the report, the costs of wrist and vertebral fractures are very low in comparison with the costs of other adverse health conditions considered in this analysis. OTA therefore concluded that adding these costs would make no difference to the basic conclusions of the study.
- OTA's estimates of cost effectiveness assume complete compliance with HRT, which may be unrealistic. Studies have shown that long-term compliance with HRT is low, usually below 20 percent. The effect of incomplete compliance is to reduce the cost effectiveness of all screening/HRT regimens considered. For example, OTA found that, if 50 percent of women were to terminate ERT after only 10 years while the rest of the population remained on therapy for life, the cost per added year of life for this population as a whole would be $73,000. Although new HRT regimens under development may have fewer undesirable side effects, their ultimate impact on compliance is unknown.
- Beginning HRT at older ages (e.g., 65 years of age) may be more cost-effective than beginning it at the time of menopause, but such a conclusion depends on extrapolating the range of cardiac benefits seen in women who begin HRT at menopause to women who begin therapy at older ages.
- Some osteoporosis experts propose that HRT should be targeted to those postmenopausal women at highest risk of fracture, as determined by BMD screening. There may be other methods, however, of selecting women who would gain the most from HRT. If HRT is effective for prevention of heart disease, for example, then it may be less costly and more effective to screen women for risk of heart disease and target HRT to those at highest risk. Furthermore, targeting HRT to those postmenopausal women with low bone density may discourage those women with low risk of fracture and high risk of heart disease from taking HRT.
- Bone density screening may increase uptake of and continuous compliance with HRT. The effectiveness of osteoporosis screening as a tool for improving compliance should be evaluated against other methods for improving compliance. In addition, the use of bone mass measurements in inducing other changes in lifestyle needs evaluation in comparison with other methods of inducing multiple lifestyle changes.
- OTA analyzed the cost effectiveness of a hypothetical drug to maintain bone density without any of the adverse or beneficial side effects associated with HRT. OTA assumed that such a drug would cost about $250 per year (the annual cost of PERT today). Screening women for BMD and placing those with the lowest BMD levels on a targeted osteoporosis drug would cost approximately $155,000 per added year of life. Adjusting this ratio for improvements in the quality of life due to reduction in the number of fractures would surely make such a drug more cost-effective depending on the value people place on these improvements.