

Appendix 1: Calculating reductions in mortality attributable to the Los Angeles City Living Wage Ordinance

We used a series of scenarios to compare the potential effects of the Ordinance for different combinations of wage and health insurance benefits. For each of the scenarios we used the effect estimate parameters to estimate the change in mortality and the cost-effectiveness. The equations for these calculations are detailed below.

Decrease in deaths attributable to wage increase (ΔD_W)

The net annual change in number of deaths attributable to wage increases among living wage workers (ΔD_W) is the sum of changes in deaths for each of the three wage groups, where each group's change in number of deaths is the difference between current expected mortality (per 10,000 per year) and projected mortality based on the estimated mortality risk ratio (RR_{W_i}) adjusted for a specified increase in annual income.

$$\Delta D_W = \sum_{i=1}^3 ((\bar{M} \times N_i \div 10,000) - (\bar{M} \times N_i \div 10,000 \times RR_{W_i}))$$

Where

\bar{M} = Average mortality rate (weighted average of insured and uninsured rates)

N_i = Number of workers in wage groups 1-3

Then, to calculate the estimated mortality risk ratio (RR_{W_i}) for each wage group's estimated change in annual income ($\Delta \hat{W}_i$) for each policy scenario, assume a relative risk of mortality of 1.21 for each \$21,832 decrease in annual income for incomes less than \$49,046 per year (from Backlund et al., 1999), such that

$$RR_{W_i} - 1 / RR_{W_0} - 1 = \Delta \hat{W}_i / \$21,832$$

Then, given $RR_{w0} = 1.21$ and simplifying the equation yields

$$RR_{wi} = 1 - \left(\frac{\Delta \hat{W}_i}{\$21,832} \times 0.21 \right)$$

Where the annual change in income ($\Delta \hat{W}_i$) for each wage group in each scenario is based on the hourly wage change times an estimated 1800 actual hours worked per year (from Pollin and Brenner, 2000).

Decrease in deaths attributable to health insurance coverage (ΔD_I)

The net change in deaths attributable to provision of health insurance to previously uninsured living wage workers ($\Delta D_{I(net)}$) is the gross change in deaths attributable to the provision of health insurance ($\Delta D_{I(gross)}$) minus the increase in deaths attributable to the loss of income that workers must pay for health insurance premium costs (ΔD_L).

$$\Delta D_{I(net)} = \Delta D_{I(gross)} - \Delta D_L$$

First, we estimated the mortality reduction attributable to insurance alone, where ($\Delta D_{I(gross)}$) can be calculated as the baseline mortality rate (M_I) for being insured times the marginal increase in relative risk for being uninsured ($RR_U - 1$) times the number of workers to be insured (N_U) divided by 10,000.

$$\Delta D_{I(gross)} = M_I \times (RR_U - 1) \times N_U \div 10,000$$

Next, the effect of health insurance must be adjusted for the effect of lost disposable income on mortality (ΔD_L), since workers must pay a portion of their health insurance premiums. From the hourly amount workers contribute towards health insurance (I_w) the annual amount of lost income (L) can be calculated, then this amount is used in

the same equations as above to calculate the number of deaths attributable to lost income for each wage category

$$\Delta D_L = \sum_{i=1}^3 ((\bar{M} \times N_i \div 10,000) - (\bar{M} \times N_i \div 10,000 \times RR_{Li}))$$

Where the relative risk of mortality for a specified drop in disposable income due to workers' out-of-pocket expenses for health insurance premiums (RR_{Li}) can be expressed as

$$RR_{Li} = 1 - \left(\frac{L_i}{\$21,832 \times 0.21} \right)$$

assuming an average of 1800 working hours per year such that

$$L_i = -I_w \times 1800 \text{hrs} / \text{yr}$$

Cost-effectiveness (CE)

The relative cost-effectiveness (CE) of the Ordinance's benefits (wages and/or health insurance) in reducing mortality among living wage workers, expressed in terms of dollars per death prevented, is the total direct costs of the benefits (\hat{C}) divided by the estimated number of deaths prevented (ΔD).

$$CE = \hat{C} / \Delta D$$

Where the costs of the benefits (\hat{C}) equal the sum of the annual aggregate cost (to employers) of wage increases ($\Delta \hat{W}$) and the annual aggregate employer contributions towards health insurance premiums (\hat{I}) provided as a result of the living wage ordinance.

$$\hat{C} = \Delta\hat{W} + \hat{I}_e$$

With the aggregate annual employer cost of wage increases ($\Delta\hat{W}$) calculated as the sum of the products of the amount of the hourly wage increase (ΔW_i), number of hours worked each year and number of workers for each wage group (N_i).

$$\Delta\hat{W} = \sum_{i=1}^3 (\Delta W_i \times 1800 \text{hrs} / \text{yr} \times N_i)$$

And, the aggregate annual employer cost for health insurance (\hat{I}_e) is calculated as the specified hourly compensation rate of employers' contribution towards workers' health insurance premiums (I_e) times the number of hours worked each year times the number of uninsured workers to be insured under the ordinance.

$$\hat{I}_e = I_e \times 1800 \text{hrs} / \text{yr} \times N_U$$

To complete the calculation of cost-effectiveness the change in the number of deaths attributable to the ordinance's benefits (ΔD) can be calculated as the sum of the change in deaths attributable to wage increases (ΔD_w) and the change in the number of deaths attributable to the provision of health insurance (ΔD_I).

$$\Delta D = \Delta D_w + \Delta D_I$$