So $\nu^+(z)$, $\nu^-(z)$ have decreased

$\Rightarrow$ $F_{Z(Y)}(Y_i')$ has increased

$\Rightarrow F_{Z(Y)}(Y_i') \leq F_{Z(Y')}(Y_i')$ □

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in particular for $Y \leq Y'$,

$p_i = F_{Z(Y)}(Y_i) \leq F_{Z(Y)}(Y_i') \leq F_{Z(Y')}(Y_i') = p_i'$

to if $Y \leq Y'$

Then $p_i(Y) \leq p_i(Y') \Rightarrow p_i(Y') \geq d_i$

$\Rightarrow Y' \in \{P_i(Y) \geq d_i\}$

□

$$\mathbb{P}(X \in D \mid Y \in A) = \boxed{\int_A \mathbb{P}(X \in D \mid Y = y)\, dy)\, dy}$$

$$= \int_A \int_D p(x|y)\, dx dy.$$

$$\frac{\mathbb{P}(X \in D, Y \in A)}{\mathbb{P}(Y \in A)} = \frac{1}{\mathbb{P}(Y \in A)} \int_{A,D} p(x|y)\, dx dy.$$

$$= \int_D \int_A \frac{p(x|y)\, dy\, p(y)}{} \, dy\, dx$$