To get The equations for $P_{str}$ and its $S_{str}$, I said replace $\sigma$ with $\sqrt{\pi(1-\pi)}$. To see why, do this: What is the mean and std. dev. of of a <u>population</u> of $N_0$ zeroes and $N_1$ ones?

$$\mu = \frac{1}{N}\sum_{i=1}^{N} x_i = \frac{1}{N}\left[\underbrace{0+\cdots+0}^{N_0} + \underbrace{1+\cdots+1}^{N_1}\right] = \frac{N_1}{N_0+N_1} = \pi .$$

$$\therefore \boxed{\mu = \pi}$$

use $N$, not $(N-1)$, here. You'll see why later.

$$\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}(x_i-\mu)^2$$

$$= \frac{1}{N}\left[\underbrace{(0-\mu)^2+(0-\mu)^2+\cdots}_{N_0 \text{ terms}} + \underbrace{(1-\mu)^2+(1-\mu)^2+\cdots}_{N_1 \text{ terms}}\right]$$

$$= \frac{1}{N}\left[N_0(0-\mu)^2 + N_1((1-\mu)^2\right]$$

$$= \frac{1}{N}\left[N_0\left(0-\frac{N_1}{N}\right)^2 + N_1\left(1-\frac{N_1}{N}\right)^2\right] \qquad \mu = \pi = \frac{N_1}{N}$$

$$= \frac{1}{N}\left[N_0\left(\frac{N_1}{N}\right)^2 + N_1\left(\frac{N_0}{N}\right)^2\right. \qquad N = N_0 + N_1$$

$$= \frac{N_0 N_1}{N^3}(N_0+N_1) = \frac{N_0 N_1}{N^2} = \frac{N_1}{N}\frac{N_0}{N} = \pi(1-\pi)$$

$$\therefore \boxed{\sigma^2 = \pi(1-\pi)}$$