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POPULATIONS WITH AGE AND DIFFUSION: EFFECTS OF THE FERTILITY FUNCTION

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Dedicated to Paul Waltman on the occasion of his 60th birthday

ABSTRACT. When studying the existence of solutions of the nonlinear population problem with age dependence and diffusion,

$$u(x,t) = \int_0^\infty \rho(x,t,a)\,da$$
$$\rho_t + \rho_a = k(\rho u_x)_x - \mu(a,u)\rho$$
$$\rho(x,t,0) = \int_0^\infty \beta(a,u)\rho(x,t,a)\,da$$

some simplifying assumptions are necessary. Here we discuss the effects of a birth function of the form

$$\beta(a,u) = \beta(u)ae^{-\alpha a}$$

and a death function $\mu(a,u) = \mu_0(u)$, in terms of existence of solutions and localization of the population.

1. Introduction. We consider here a nonlinear one-dimensional population problem with age dependence and diffusion as proposed by Gurtin and MacCamy through several papers [**9, 12, 8**].

Let $\rho(x,t,a)$ denote the number of individuals per unit age and unit length who are of age a at time t and position x. The total population at x and t is

$$u(x,t) = \int_0^\infty \rho(x,t,a)\,da. \tag{1.1}$$

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