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Honeybee demography: the effects of food and brood.

In honey bee colonies, which are known as hives, adult worker bees can be divided into two broad castes: hive bees and foragers. Foragers work outside the hive, collecting nectar and pollen while hive bees work inside the hive, caring for brood, cleaning, and storing what the foragers have collected. Brood is the collective name for the eggs, larvae and pupae that develop into adult bees. When worker bees first emerge from pupation they work as hive bees and make the transition to foragers as they age. The age of the worker bees at this transition is affected by the number of existing foragers and the levels of stored food in the hive.

A crucial contributor to hive well-being is the health, productivity and longevity of its foragers. When forager numbers are depleted there is a significant effect, not only on the amount of nectar and pollen that can be collected but also on the colony's capacity to raise brood and on the age that bees make the transition from hive bee to forager. We use a set of differential equation models to explore the effect on the hive of high forager death rates on the total population of the hive and the effect of precocious transition to foraging on food collection, brood rearing and hive viability.