1 Introduction

1.1 Background

For the first time in history, our generation and future generations will live in a world populated by people that are dominantly old. It is estimated that human life expectancy in the Stone Age was around 20-34 years [2]. We can consider this as the natural life expectancy at birth for our species. However, nowadays, those born in Japan can expect to live 84 years [3]. This implies there has been roughly a tripling of life expectancy for humans in the last few thousand years, which has dramatically altered the way societies and communities including healthcare systems work. Before the 20th century, medical care was delivered at home, through visits from mobile family physicians who packed the necessary medical technology into a doctor's bag. In the 20th century rare and expensive resources, such as heavy technology and specialist providers, had to be centralized in hospitals to make their utilization effective [4]. Nowadays, driven by a massive increase of age-related illnesses, high healthcare costs and the need for long-term care and assistance [5], the healthcare systems need to change radically from healthcare professional-centric systems to distributed networked healthcare systems in which the individual becomes an active partner in the care process [6]. In this transformation, pervasive technologies and data analysis techniques are playing a major role enabling new care services such as long term monitoring and supportive systems [7]. Research on pervasive computing technologies for healthcare does not aim to replace traditional healthcare but is rather directed towards paving the way for a pervasive, user-centred and preventive healthcare model in which, for example, patients will be managed in their own environment under the remote assistance of the caregiver. This model particularly applies to the management of chronic disease conditions that exert a big pressure on the healthcare systems due to their high costs and increasing death rates. While deaths due to major diseases decrease, the worldwide prevalence and related deaths of chronic diseases are continually increasing. As shown in Figure 1, between 1970 and 2002, out of the six leading causes of death the largest drops occurred in the death rates due to heart disease (52%), cerebrovascular disease or stroke (63%), and accidents (41%) [8]. In contrast, death rates increased by 45% for diabetes mellitus since 1987 (3% net increase from 1970 to 2002) and they even doubled for chronic obstructive pulmonary disease (COPD) since 1970 [8].