

# A cost-effectiveness analysis of genetic testing of the DRD2 Taq1A polymorphism to aid treatment choice for smoking cessation

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We conducted a cost-effectiveness analysis of genetic testing for smoking cessation, based on data available from the published pharmacogenetic studies of nicotine replacement therapy and bupropion, and a previous cost-effectiveness analysis of smoking cessation treatments. We use multiparameter evidence synthesis methods to combine evidence on cessation by genotype with evidence on cessation irrespective of genotype (which can be written as a function of genotype-specific parameters). Our intention was to explore the most cost-effective approach to prescribing smoking cessation pharmacotherapy, given the hypothetical availability of a test based on a single-gene variant that has been reported to predict treatment response. We considered four types of treatment: nicotine replacement therapy (NRT) pharmacotherapy, bupropion SR pharmacotherapy, combination NRT and bupropion, and standard care as the control. Two scenarios were investigated, one in which the control represented brief advice and the other in which the control represented individual counseling. Strategies that either do not test for dopamine D2 receptor (*DRD2*) genotype (each individual receives the same treatment), or do test for *DRD2* genotype (treatment allocated according to genotype), were evaluated. Our results indicated that the most cost-effective strategy in our hypothetical example of a single-gene test to aid prescription of smoking cessation pharmacotherapy is to prescribe both NRT and bupropion regardless of genotype, as a first-line treatment for smoking cessation. We conclude that it should not be assumed that genetic tailoring will necessarily be more cost-effective than applying the current “one-size-fits-all” model of pharmacotherapy for smoking cessation. In addition, single-gene tests are unlikely to be cost-effective, partly because the predictive value of these tests is likely to be modest.

## Introduction

Nicotine replacement therapies (NRTs), such as nicotine gum, patch, spray, inhaler, and lozenge, and bupropion are currently the principal U.S. Food and Drug Administration (FDA)-approved first-line pharmacological treatments for smoking cessation, although varenicline has recently gained approval

(Foulds, 2006). Several meta-analyses have indicated that both NRT (Fiore, Smith, Jorenby, & Baker, 1994; Silagy, Lancaster, Stead, Mant, & Fowler, 2004) and bupropion (Hughes, Stead, & Lancaster, 2004; Scharf & Shiffman, 2004) increase cessation rates compared with placebo. Despite the proven efficacy of these treatments, however, absolute quit rates remain low, and a number of published studies have reported evidence that genetic variation may be associated with response to smoking cessation pharmacotherapy (Johnstone et al., 2004; Lerman et al., 2002; Lerman et al., 2004; Munafò et al., 2006; Swan et al., 2005; Yudkin et al., 2004). The basic premise of this approach is that inherited differences in drug metabolism and drug targets have important effects on treatment toxicity and efficacy (Evans & Relling, 1999; Poolsup, Li Wan Po, & Knight, 2000). Advantages of a pharmacogenetic approach to the

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