# Effects of hospital-based smoking cessation interventions

The Effects of Hospital-Based Smoking Cessation Interventions on 10-Year Mortality *Among Adult Smokers 18-64*

- Eline van den Broek

1 Setting up the Research Designs

1. *Background*

Tobacco use is the leading preventable cause of disease, disability, and death in the United States [CDC, 1]. It is estimated that cigarette smoking results in more than 480, 000 premature deaths and approximately 8. 6 million Americans live with a serious illness caused by smoking [2]. Research has established smoking causes various serious diseases such as cancers, lung diseases such as chronic bronchitis and emphysema, and increases in the risk of heart disease, including stroke, heart attack, vascular disease, and aneurysm [3-37]. Various studies, including RCT's, cohort and case-control studies, concluded that adults who smoke die earlier than nonsmokers [3-37]. Reversely, researchers have also found that preventing deaths caused by smoking would lead to substantial gains in life expectancy [38-41].

While we have gathered extensive information about tobacco use as a major cause of many of the world's top killer diseases, responsible for the death of about 1 in 10 adults worldwide [42], less is known about the effects of different *smoking intervention programs* on mortality and life expectancy. Successful smoking cessation interventions almost certainly result in major gains, both in reducing smoking-related illnesses and potentially in preventing premature deaths [43]. The more evidence we have on what type

of programs are most effective in smoking cessation, the easier it would be to address the crucial public health and policy question whether these programs are desirable in the context of avoidable mortality. Also, since most studies have focused on comparing smokers to non-smokers, we need more evidence about the effect of different interventions among smokers only.

In Colorado, over 900, 000 residents currently smoke, with the highest rates among young adults aged 18 to 24 years (28. 2%). In 2000, 52. 8 percent of adult smokers in Colorado made quit attempts of at least one day. [44] Researchers in the University of Colorado Hospital (UCH) have decided to implement a smoking cessation intervention, including bedside consultation with follow-up therapy and free nicotine replacement therapy (NRT). [45] The objective of this study is to determine the effect of this UCH-initiated intervention on 10-year mortality. The aim is to implement hospital systems change to improve inpatient tobacco dependence treatment. [45] Most of the literature involving smoking cessation interventions is related to outpatient interventions. Some studies have focused on the effect of inpatient smoking cessation interventions and rehospitalization. [46] Our study will contribute to that body of literature, focusing rather on an inpatient smoking cessation intervention and its effect on *10-year mortality* .

2. *Research Questions and Hypotheses*

Research Question:

Does a hospital-initiated smoking cessation intervention predict lower 10-year mortality rate?

Hypothesis:

We hypothesize that the hospital-based intervention to encourage tobacco using inpatients to quit smoking has a significant lowering effect on 10-year mortality rate.

*$H_0$ : There is no significant effect of the UCH inpatient smoking cessation intervention and 10-year mortality*

*$H_a$ : There is a significant effect of the UCH inpatient smoking cessation intervention and 10-year mortality*

Recall bias is a classic form of information bias: we will not collect the correct information, because the subjects in the study report past events in a manner that is different between the two study groups case-control. Since our study will be backwards in directionality, it would in general be more prone to information and recall bias. This happens, for instance, if our cases and controls will differentially recall intervention, related smoking behavior, or any other variables that we include in the model that are based on self-reported data, so that inaccurate recall is related to characteristics of the exposure of interest and of the respondents. Yet in our case, the most important information is collected using information recorded in the electronic medical record, so we will are less worried about this type of bias in our design. Interviewing technique and the study protocol, including the design of questionnaires and the motivation of respondents, play a central role and are under the control of the investigator. [130]

Even though we think that our matching process will limit confounding bias, we still may deal with the issue that the influence of one intervention is mixed with the effect the other. For example, the intervention may have led to other healthy lifestyles, such as less alcohol use or more exercise. This would be less relevant in our case, however, because we are really interested in the effect of the intervention on mortality. If the intervention has positive effects on other healthy behaviors, that will not bias our conclusions.

In case-control studies, selection bias can occur in the selection of cases if they are not representative of all cases within the population, or in the selection of controls if they are not representative of the population that produced the cases. [131] It could be that cases and/or controls are selected on criteria related to the intervention, for example they are selected differentially on the basis of their intervention or there may be differences in reporting of which intervention they received between cases and controls. We may have a concern with selection bias in our study design, because both the intervention and the outcome have occurred by the time the patient is recruited into the study.

The (internal and external) validity of a case-control study depends on the representativeness of controls. [132, 133] The controls need to be a representative sample of the study population from which the cases are drawn during the study period. Since we will use a computer generated pool of controls, they will be randomly selected to minimize bias. We do expect some issues with consenting the controls and expect that we will have to use second or third drawn controls to match with some of the cases. Generally, “

hospital controls” are often more easily accessible and tend to be more cooperative than “ population based” controls. [50] A disadvantage of drawing from a hospital population is that we will have an issue with the external validity of the study. The question remains whether we will be able to generalize the results from the UCH-based population to other inpatient interventions or even more broadly: a population based intervention.

*4. 8 Study Strengths*

Among the strengths of a case-control study are the fact that they are generally relatively inexpensive, they are short-term studies to conduct (so cheaper and quicker); they are efficient designs for rare diseases or for studies with a lagged outcome like mortality in 10 years; and they can be powerful with small samples of cases.

While the 1: 2 matching design is intended to eliminate confounding, the main potential benefit of matching in case-control studies is a gain in efficiency. We do need to note that since we currently design the study and the intervention(s) still need to take place, we will have to wait for 10 years to measure the effect on mortality. But as mentioned, another advantage of a case-control study is that they are typically feasible to obtain sufficient numbers of cases when studying rare diseases or diseases with a long latency period, like in our case: mortality in 10 years. We will thus require a smaller sample size than with other designs and we can still evaluate the effect of the different types of interventions. The fact that we have the ability to use multiple controls of the same type has the advantage of increasing the study’s power.