



# NUDGING SMOKE IN AIRPORTS

## *A CASE STUDY IN NUDGING AS A METHOD*

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### INTRODUCTION

In 2004 more than 600,000 deaths worldwide were attributable to second-hand smoke amounting to 1% of the worldwide mortality [1]. Against this background, Denmark like many other countries around the world, banned indoor smoking back in 2007 from workplaces, restaurants, and other contexts potentially exposing non-smokers to second-hand smoke. While the law has been a huge success in changing smokers' behaviour patterns, it has also created the well-known phenomenon of smokers piling up just outside the doors of public buildings, pubs, and offices.

Though more considerate than smoking indoors, smokers just outside doors impose a health-related risk for those working next to and above door areas. This is especially true since modern ventilation systems in sustainable buildings often integrates natural ventilation from revolving doors, windows and other features of the architecture. Also, a crowd of people smoking just outside the doors might not be the "first impression" any company or organisation would like to give.

With modern ventilation systems and more than 26 million travellers a year, of which 25% being smokers, Copenhagen Airports has seen its fair share of this problem. To solve it the airport initially established strict non-smoking zones just outside the doors and other areas with high passenger flows or ventilation intake. Yet, to the despair of the airport officials, smokers didn't seem to care much about the proscription to light up their cigarettes in these zones. Not wanting to escalate into issuing fines to their customers, the Airport teamed up with iNudgeyou hoping to nudge a reduction in health risks from air pollution inside Airport terminals coming from second-hand smoking outside the doors as well as organise smoking behaviour a bit more convenient for all parties.

To this end, we applied the BASIC© framework developed by iNudgeyou to work diagnostically with behavioural interventions. By "diagnostically" is meant that the framework allows one to systematically develop nudges - as well as other behavioural interventions, based on an empirically

**Nudge:**

A 'nudge' is a function of (condition l) any attempt at influencing people's judgment, choice or behavior in a predictable way (condition a) that is motivated because of cognitive boundaries, biases, routines, and habits in individual and social decision-making posing barriers for people to perform rationally in their own self-declared interests, and which (condition b) works by making use of those boundaries, biases, routines, and habits as integral parts of such attempts.[2]

**Nudging:**

The term 'nudging' refers to the systematic and evidence-based development and implementation of nudges in creating behavior change. [3]

informed understanding of the behaviour that one intervenes with. The argument for working with diagnostic approaches is that these allow for systematically developing cautious, effective and minimally intrusive nudge interventions rather than interventions characterised by the formulation “we set out to test”, that leap blindly from the laboratory into the real world without proper orientation and carefulness. That is, just like a doctor should use systematic methods for diagnosing diseases before medicating, behavioural science should systematically diagnose before intervening with the lives of the citizens it serves.

has data. Insensibly one begins to twist facts to suit theories instead of theories to suit facts”[i]. This is in many ways as true for behavioural science as it is for fictional early 1900's detective work. Not surprisingly then, we spend a prolonged period of time observing and structuring data about the behaviour of smokers – and of course, just as Sherlock Holmes, the master of disguise, would have it, we dressed up as regular travellers [ii].

As part of the B phase 2000 smokers in total were observed at Copenhagen Airports in an increasingly structured way. In this phase, we set out to collect behavioural data by observing the multiple actions that make up smoking behaviour in an airport.

Initial observations revealed a host of interesting patterns, but in particular, it revealed patterns of what seemed to be purposeful action insofar as the smoking went, but much less so when it came to placement. For instance, smokers, in general, (1) had their cigarettes in their mouths and lighter in hand while still well inside the revolving doors leading out of terminals, (2) made the ‘tourist stop’ just outside and only then (3) searched for a place to smoke. We observed that aspects of the immediate environment just outside the door, captured smokers’ gaze, such as benches, ashtrays, pillars, stones, fellow smokers, etc.

Turning to more and more structured observations, we started to map behaviour into main quantifiable categories that seemed relevant, including where smokers came from, where they end up smoking, and where they went afterwards. The process of quantification provided us with new insights. In particular, the ratio between people coming from inside the airport and people coming from outside was a bit surprising. Airport officials had initially thought “door smokers” mainly were travellers who just had arrived in the airport and smoked one last cigarette before entering the buildings. Yet, the

**BEHAVIOURAL MAPPING**

The first phase, B of the BASIC© approach, is Behavioural Mapping.

Besides involving behavioural reductions of aggregated problems – such as reducing risks from second-hand smoking to the various behavioural patterns involved – this phase is especially about creating, assembling and structuring data. Behavioural data is vital for creating an effective nudge, and there is no better way to get it than by direct, but time-consuming, observation as it keeps theorising close to the actual behaviour you're interested in changing.

**B**

**BEHAVIOURAL MAPPING:  
OBSERVING SMOKERS'  
BEHAVIOUR**

As Arthur C. Doyle's Sherlock Holmes puts it, “It is a capital mistake to begin theorising before one

numbers revealed that 85 percent actually came from inside the building with the 33% of smokers staying in a non-smoking area for the entire duration of the cigarette, and then returning inside.

## ANALYSIS

The second phase of the BASIC© approach is 'A' for analysis. Where the B phase is about answering questions of "what?" the A phase is about answering questions of "why?". Such analysis is conjectural by its nature and takes the form of abduction, but may be supported by means of data provided by any methodology compatible with Dual Process Theory. Hence, everything from common sense and introspection over knowledge grounded and hypothesis-based observation to background research are applied to provide the strongest explanation of observed behavioural patterns.

A

## ANALYSIS

People tend to have an effort minimising disposition during decision making. Some research point to the fact that humans are cognitive misers, hence, prone to spend the least amount of energy on decision making in order to reduce the consumption of scarce mental resources [4]. This also seemed to be the case with the smokers at the airport. Based on our observations it seemed this applied here and that the smokers weren't willing to put much thought into finding the correct place to smoke.

This apparent challenge gave rise to considerations about what would be the best way to limit the cognitive effort afforded by smokers in order to comply with smoking rules at the airport. We hypothesised that smokers choose where to smoke outside at a relatively late point in time. The smokers seemingly made the decision about placement only after having lit their cigarette, and that this was the reason for the 'tourist stop' mentioned above.

The attractive qualities of the outdoor facilities (benches, ashtrays, etc.) made sense when using the lens of 'affordances' on the context of smoking. Following Donald Norman, all objects afford certain interaction and usage. "An affordance is a relationship between the properties of an object and the capabilities of the agent that determine just how the object could possibly be used. A chair affords ("is for") support and, therefore, affords sitting." [5]. By analogy, we worked on the assumption that a

context may afford for a particular behaviour as well.

Based on observations, this perspective implied that smokers were attracted to the areas that afforded them behaviours such as sitting down and leaning against, as well as seeking refuge from wind and weather. An inconsiderate arrangement of the affordances in the environment could thus lead smokers to place themselves in the inappropriate non-smoking zones. In addition we included other smokers' behaviour as part of the context. This, led to the standard social psychological hypothesis that smokers are drawn to imitate other smokers behaviour as social proof of acceptable behaviour in the context.

The term social proof refers to situations in which individuals try to determine a correct course of action by looking at what other people do. People tend to view what other people do as clues on 'correct behaviour' [6], and smokers were doing that for each other with regards to placement. This meant that negative and positive patterns could be expected to be self-reinforcing. Based on these insights we went on to develop a more effective choice architecture based on multiple nudges.

## SOLUTION MAPPING

The third phase of the BASIC© approach deals with Solution mapping (hence the 'S' in BASIC©). This phase is a not a creative one, but rather a scientific and systematic process. As Jonas Salk, discoverer of the Polio Vaccine, beautifully states it: "It is the questions we must define and discover. You don't invent the answer-you reveal the answer".

The phase thus emphasises thorough research of the scientific literature as well as existing solutions to problems based on similar diagnoses. It also includes adaptation of solutions that may be mapped onto the problem as well as an ethical screening [7] of the acceptability of the adapted solution relative to the target group and context.

S

## SOLUTION MAPPING: SALIENT PRESCRIPTION RATHER THAN PROSCRIPTION

Considering the analysis it was evident that the usual logic of non-smoking zones seemed backwards. With smokers putting little effort into deciding on

a place to stay, we believed that a prescription might work better than a proscription. Proscriptions constrain people's choices but don't otherwise guide decisions. Hence, proscriptions require effort to follow, rather than making it easy. So we decided to turn the logic around. The intervention came to consist of three layers aimed at the dominant behaviour pattern observed in the behavioural mapping phase – i.e. smokers coming from inside the building, looking down, lighting a cigarette and then deciding on a place to smoke. The three layers were:

### **Stickers on the ground - guiding the search**

In order to prepare smokers to look for where to smoke upon leaving the building, we gave them a search cue. Stickers showing an icon of a lit cigarette plus a number of meters were put on the floor inside the airport in those areas where smokers were observed to initiate their smoking behaviour by walking towards the door and reaching into their pockets for their cigarettes.

### **Designating zones for smoking - action directing prescription**

The stickers showed the way to salient smoking zones a safe distance from open areas and air-condition intakes. This made the zones easier to spot in a lazy search, in accordance. These zones consisted of square zones marked by yellow Duct tape, cigarette icons as well as yellow cylindrical ashtrays to serve as designation for smokers. All was made consistent with the colour and design template of Copenhagen Airports. To the extent possible, the zones were made to look as the recommended option for smokers.

### **Re-arrangement of environmental affordances**

To make sure the environment afforded considerate smoking behaviour in the zones, the affordances influencing smoking behaviour that could be re-arranged was re-arranged. Some of the benches were moved outside the non-smoking zones so as to allow basic comfort affordances in the smoking zones.

Taken together, the three layers of the intervention created and supported an action directing prescription, showing smokers that there were rules they were expected to follow. Furthermore, the intervention also made it easy for them to do so by guiding them through the necessary actions. This is in line with the theory of implementation

intentions, stating that intentions to comply with rules and reach goals are much easier implemented when the behaviour leading to them is guided [8]. Thus, on their path out, smokers were met with directional instructions for smoking, and met salient and clearly designated smoking zones. The zones included proper environmental affordances to keep them from deviating from the prescription. After completing the designs for the intervention, we set out to test it.

### **INTERVENTION**

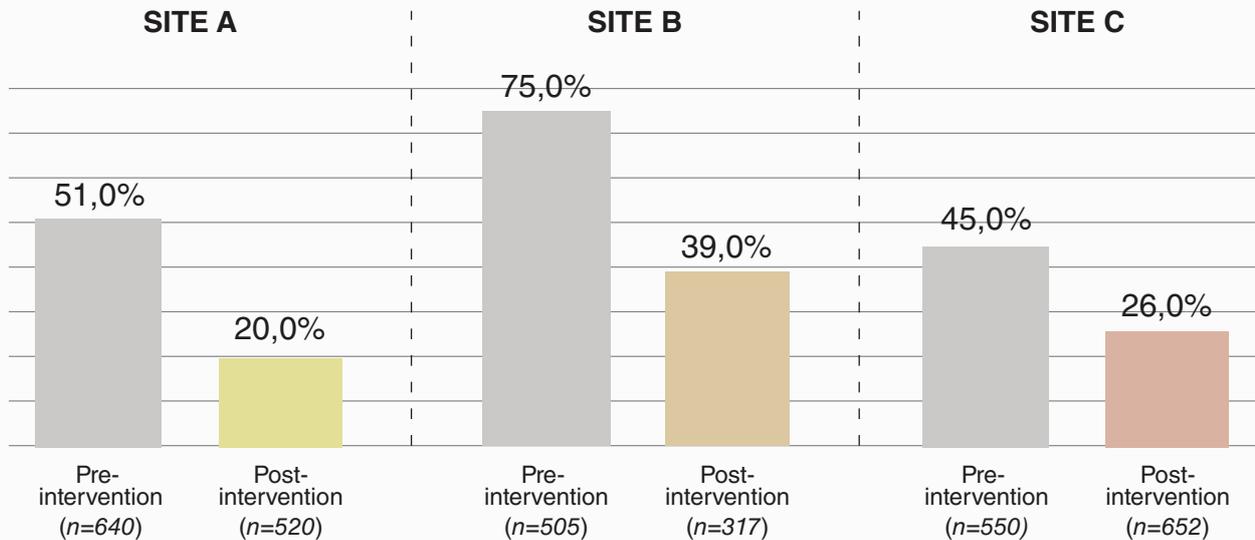
The fourth phase of the BASIC© approach consists of devising an intervention (the "I") that tests the behaviour change concept developed in the prior phase of solution mapping in a real world context. The phase, thus, aims at developing, quality checking and executing an experimental design that tests the real world effect of the combined - not isolated - solution concepts identified in the prior phase in the context targeted. In particular, the aims is to provide quantified evidence informing a decision as to whether to implement the nudge-solution resulting from the first three faces.

### **INTERVENTION**

We were interested in measuring whether the intervention would reduce the frequency of smoking in the non-smoking zones outside the airport as part of an effort to avoid non-smokers getting exposed to second-hand smoke.

We selected three door areas at the Copenhagen Airport, where our initial observations had indicated the greatest concentration of smokers. The sites were known as 'door 2', 'door 4' and 'door 7'. Implementing the solution at different doors with small differences allowed us to estimate the general effectiveness of the solution by introducing environmental noise. The three areas were measured for approximately 25 hours each, over a period of 3 months from March 2013 to May 2013.

The observers dressed as travellers and tried to blend in with the crowd in order to minimise the effect of our presence on the environment. The observers classified smokers using a notation system [iii]. Only smokers who smoked their entire cigarette outside the non-smoking zone were treated as compliant, the rest being classified as non-compliant. We expected to find a difference in the distribution

**FIGURE 1: Percentage of non-compliant smokers in 2013**

of compliant vs non-compliant frequencies in the control and intervention conditions.

After the baseline observation, the intervention was implemented by Copenhagen Airports. We were able to resume observations within a few months. Intervention observations were continued for 24 hours in total for us to build up a comparable sample.

In the end a total of 3184 smokers were observed during the entirety of the observational period (baseline = 1695, intervention = 1489).

## RESULTS

The result of comparing the baseline behaviour of 1.695 smokers with that of the intervention

behaviour of 1.489 is reported in figure 1 above. We saw reductions in non-compliant smoking at all implementation sites (Fig. 1).

As the implementation sites were slightly different (both intuitively and with relation to base rate compliance level), we decided to weight the effect on each door by sample size, to get an overall estimate of the effect. The results showed a weighted mean reduction of 49.0% in non-compliant smoking.

## CONTINUATION: WHY NUDGE INTERVENTIONS THRIVE AND FAIL

Sceptics often voice their concern that nudges probably do not work in the long run. Why should they? After all, they are soft measures, so why should their effect persist beyond novelty. This is of course a difficult concern to calm. Nudging is an empirical discipline and as such you cannot provide any answers from the armchair. Also, as there exists a great variety of nudges we should expect differences in the long term effects accordingly; and while these differences may be predictable in theory, there is no theory (about reality) without data. Not surprisingly, then, recently published research on energy-saving behaviour also highlights that certain behavioural interventions induced persistent behaviour change after 90 days whereas the effect of others decreased [9].

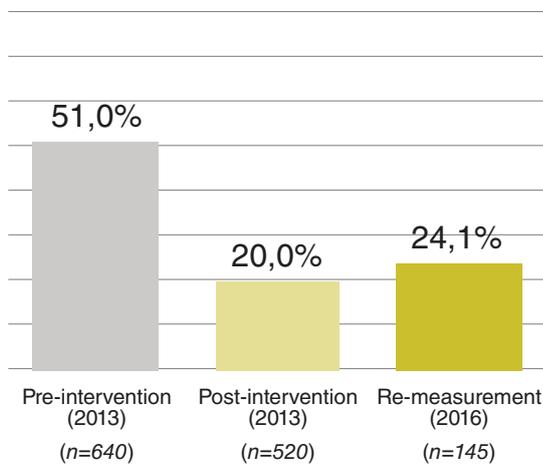
We found the question of novelty to be valid for a physical intervention such as ours. We thus returned to the airport three years later to measure whether

### CONTINUATION

Despite evidence, solutions often fail due to poor institutional implementation or lack of maintenance. For this reason the BASIC© approach explicitly includes Continuation (the 'C') as part of the framework for developing successful nudges. In the 'C' phase a general plan for full implementation and monitoring of the continuous effect of the behaviour change intervention is devised. This includes practical issues of future institutional responsibility for the implementation as well as monitoring for continuous effect and side-effects.



**FIGURE 2: Non-compliant smokers at Site A**



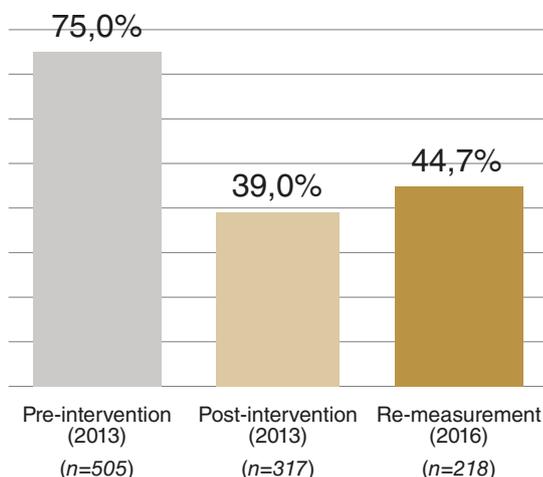
the effects of the intervention had worn off over the years or had stood the test of time.

Once again we donned disguises and went into the field to count smokers. Albeit refreshed once or twice, the elements of our “new” choice architecture had degraded over the years, as most physical interventions do. One door (at Site B) had been changed so much that we barely recognized it, but a door just beside it resembled it almost perfectly, so we decided to measure that instead.

**Site A - light degradation**

This zone was mostly intact. The end of the zone had degraded, but was otherwise easily discernible, thus preserving the prescription logic.

**FIGURE 3: Non-compliant smokers at Site B**

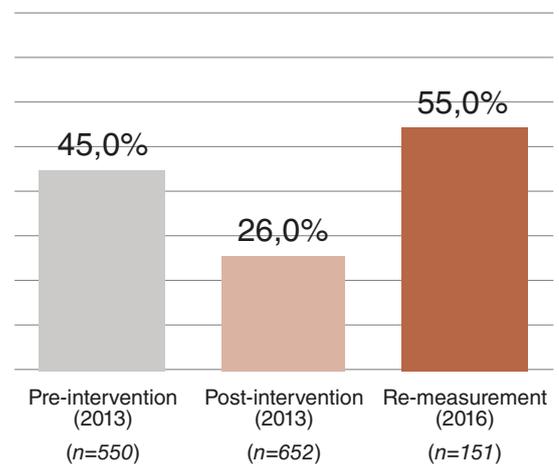


The stickers indoor and inside the zone were intact as well, setting smokers on the correct search path. Re-measurement at this door showed results comparable to the intervention, with only a four percent point increase in non-compliant smoking (Fig. 2).

**Site B - lack of search cues**

The smoking zones were mostly intact, again preserving the prescription logic. The stickers, however, were missing at the exit, removing a layer of the intervention. Results showed an increase in non-compliance but non-compliance was still 23 percentage points below the baseline measurements (Fig. 3).

**FIGURE 4: Non-compliant smokers at Site C**



**Site C - severe degradation and reversal of affordances**

One of two smoking zones near door 4 had mostly degraded and was barely discernible. The stickers were still present, but referenced the smoking zone that had degraded, creating confusion. All benches had been removed from the non-smoking zones and moved to the smoking zone. Results showed an increase in non-compliance compared to baseline measurements (Fig. 4).

**CONCLUDING REMARKS**

The re-measurement of our nudge intervention provided an interesting insight as to what makes a nudge thrive or fail. Saliency is not an immutable property. The wind, weather and shoes can do a lot to an environmental nudge, and the lasting

effect of an intervention is thus conditional on its maintenance. In our re-measurement, the well-maintained intervention at door 7 showed little decrease in effect. However, when the zones had degraded, the effect decreased or even changed direction. This suggests that so long as the underlying behavioural diagnosis remains true and the intervention is maintained, the effect will last.

Considering the mechanism design and results there is no reason why this intervention cannot be implemented in many other settings. We invite everyone who is interested in implementing the solution where they see a similar behavioural pattern, such as public buildings, pubs and offices, and share their own results with us and the rest of the behavioural science community!

However, one should observe that a central component of the behavioural mapping and hence the diagnosis is the fact that people are coming from inside and re-entering, as they are more likely to accept the prescription. The central logic of the intervention is the prescription of a 'place' to smoke. However, if people are on-the-go while travelling they have no reason to stop and stay in the zones, and thus reject the prescription. Thus, one should not try to implement this choice architecture where the diagnosis does not apply, such as train stations, as that type of behaviour to be affected much by prescriptive smoking zones.

## Notes

[i] Actually we have a bit more Kantian approach to the relationship between data and theorizing. So alluding to Kant's Critique, B75, it is perhaps a bit more precise for us to say that we believe that "Theorizing without data is empty, and data without theorizing are blind."

[ii] This was to reduce any observational effect we might have on the environment.

[iii] The full data from this is available upon request. [X] Öberg, M., Jaakkola, M. S., Woodward, A., Peruga, A., &

Prüss-Ustün, A. (2011). Worldwide burden of disease from exposure to second-hand smoke: a retrospective analysis of data from 192 countries. *The Lancet*, 377(9760), 139-146.

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