



Measuring for Change – TackSHS WP4

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Who I am



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Research interests:

Indoor air pollution, second-hand smoke, tobacco control, biomass fuel smoke, intervention development



Expanding air quality feedback



- Previous air quality interventions have had limitations:
 - In-depth face-to-face contact (multiple installation visits, feedback visits)
 - Short measurement periods (one day for REFRESH, one week for FS2SF due to technical limits)
- Could we develop an effective intervention that would:
 - Minimise delivery time by using remote feedback (such as email, SMS and phone)
 - Measure for longer periods?

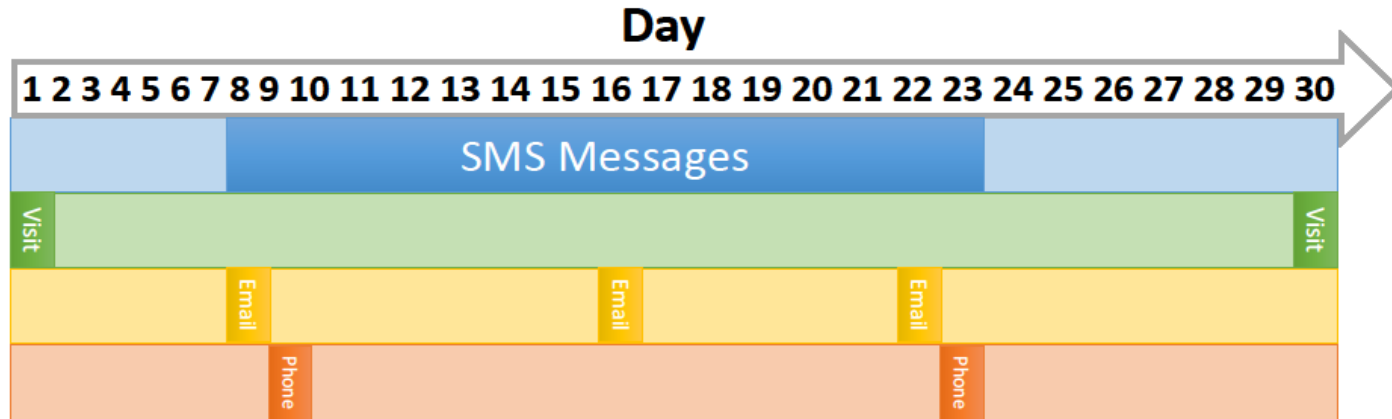


Remote air quality monitoring



- New air quality monitoring technology developing very quickly
- Dylos DC1700 provides accurate laser particle counts
- Combined with Raspberry Pi mini-computer and mobile internet access to send data to server
- Provides ability to provide study participants with near real-time feedback

Intervention programme



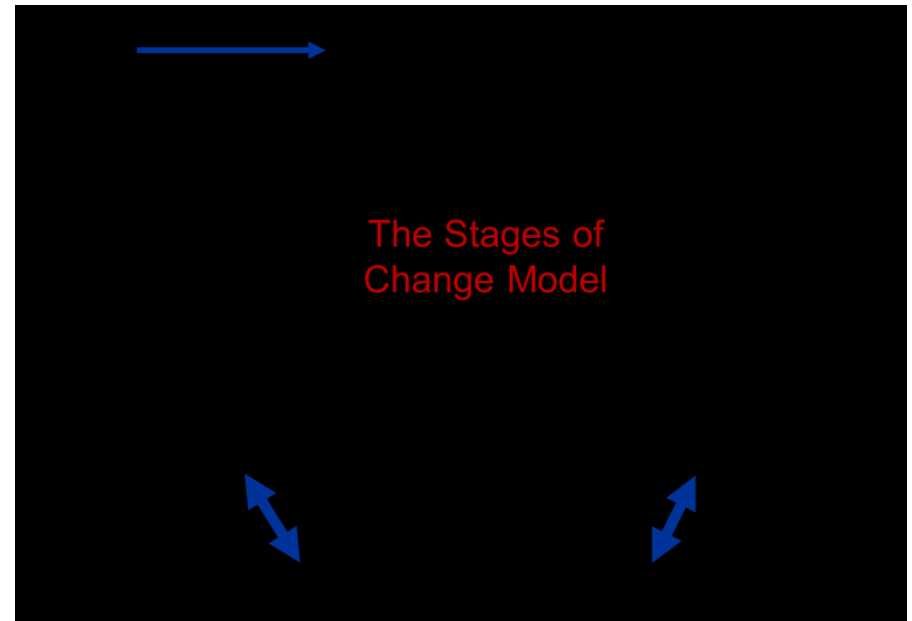
- Measurements for 30 days
- Primary outcome: PM_{2.5} concentration on day 1-7 vs day 24-30
- Two household visits (day 1 and 30)
- Daily text messages from day 8-23
- 3 emails (days 8, 16 and 22)
- 2 phone calls (day 9 and 23)



Recruitment



- Study conducted in five European centres: Stirling, Milan, Florence, Athens and Barcelona
- Participants were recruited by stage of change according to the Transtheoretical Model
- Only participants at preparation or higher proceeded to intervention
- A range of recruitment strategies used across different centres
- Facebook advertising in Stirling and (for some of) Barcelona
- More traditional recruitment at other centres

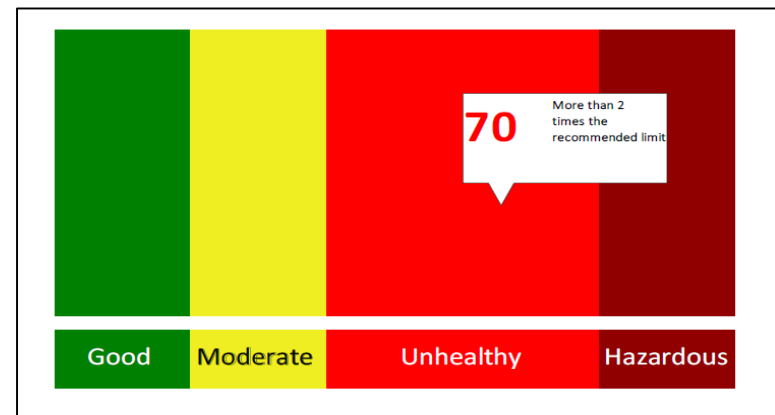
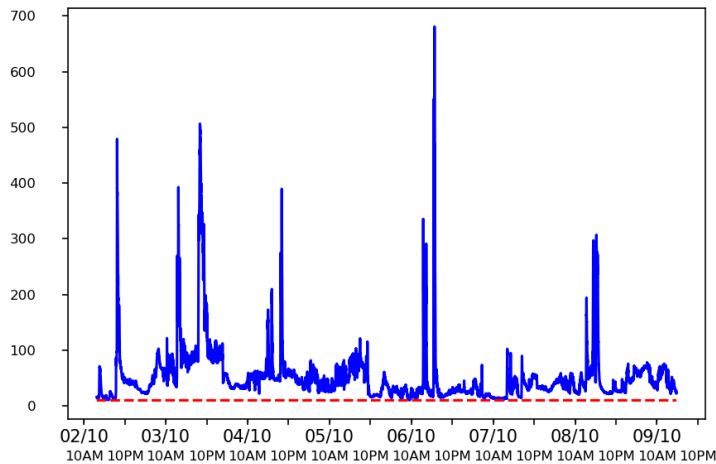


Feedback



The second-hand smoke level in your home was 121 over the last 24 hours. This is lower than the average over the previous seven days, well done! This is higher than a smoke-free home in Edinburgh. Why not text visitors in advance to let them know your home is smoke-free?

- Daily SMS message days 8-23
- Three emails (days 8, 16 & 22)
- Two phone calls (days 9 & 23)



Outcome measures



Primary outcome measure is mean $PM_{2.5}$ concentration at baseline (day 1 – 7) vs mean concentration follow-up (24 – 30)



Secondary outcome measure is time over WHO guidance level of $PM_{2.5}$ ($25\mu\text{g}/\text{m}^3$) at baseline and follow-up



We also looked at change in participants' self-reported smoking rules and attitudes to smoking in the home

Results



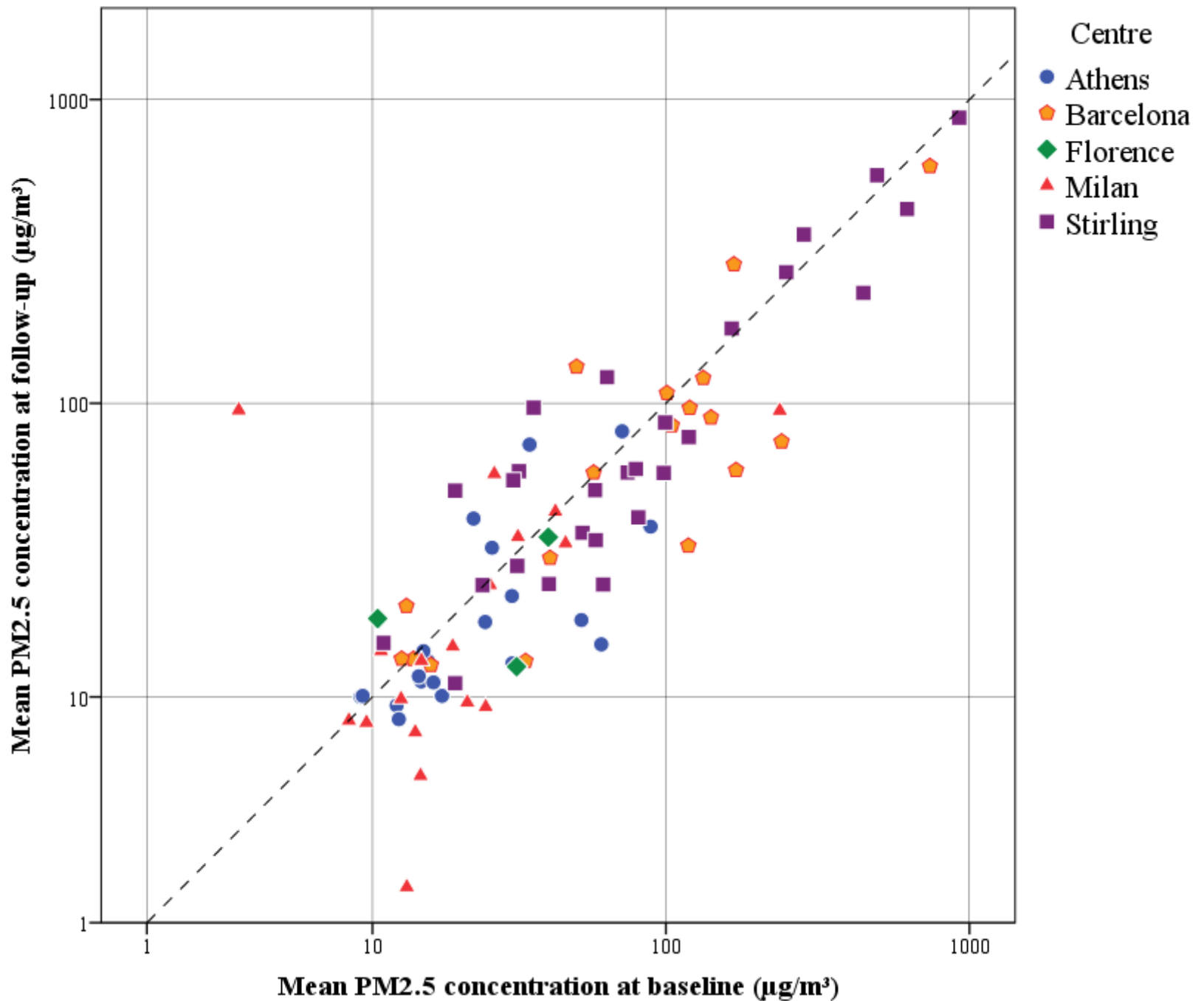
Reduction in PM_{2.5} between baseline and follow-up:
median change for paired samples: -4 μ g/m³, -18%



Time spent over WHO guideline limit fell:
median change -3.3%



57 of 86 homes experienced reductions in PM_{2.5}
(66% of total)



Feasibility of remote monitoring



- The median loss of data over the thirty days of monitoring was 4 ½ hours
- But this was highly variable
- All centres except Florence had to manually restart monitors at least once
- New custom monitors are coming on the market (such as the PurpleAir PA-II) – these may be more suitable in future

Centre	Median minutes missing per home (IQR)	Median percent age of records missing per home	Median duplicate minutes per home (IQR)
Athens	452.5 (2446)	1.02%	145 (84)
Barcelona	454.5	1.05%	157.5
Florence	34 (-)	0.08%	76 (-)
Milan	1170 (5178)	2.57%	113.5 (105)
Stirling	83 (1466)	0.19%	81 (147)
Overall	269 (2109)	0.62%	114.5 (116)

Conclusions and future research



- SHS declined but wasn't eliminated in the majority of homes
 - Paper available: [10.1016/j.envint.2020.105738](https://doi.org/10.1016/j.envint.2020.105738)
- The intervention was less resource-intensive than previous designs
 - But recruitment was challenging and we had some technical issues
- Remote air quality monitoring for this purpose is feasible
 - And purpose-built equipment may make it easier
- Could future interventions be wholly automatic?
 - Instant (aural) feedback has been used in some studies (Hovell, 2019, [10.1136/tobaccocontrol-2018-054717](https://doi.org/10.1136/tobaccocontrol-2018-054717))



Recruitment statistics



Centre	Initial recruitment target	Participants passing inclusion criteria	Participants included in analysis
Athens	40	21	20
Barcelona	40	27	18
Florence	20	6	3
Milan	20	20	18
Stirling	40	44	27
Total	160	110	86



Results by centre



Centre	Median baseline mean concentration	Median follow-up mean concentration	Median change for paired samples (IQR)	Median change as a % of baseline (IQR)
Athens	20	14	-3.2 (8.8)	-24 (50.7)
Barcelona	102.7	67.3	-11.2 (62.6)	-18.3 (49.8)
Florence	32	19	-4.8 (-)	-12 (-)
Milan	17	14	-2.1 (13.2)	-18 (61.1)
Stirling	64	59	-8.3 (61.7)	-12 (65.3)
Overall	33	33	-4.1 (22.9)	-19 (50.0)



Accuracy of self-reported change



- In follow-up questionnaire we asked: “[since study start] have you changed any aspect of your smoking behaviour or smoking rules in the home?”
- 77% claimed to have changed behaviour
- This was not associated with our objective measures

Centre	N	Reported behaviour change
Athens	20	20
Barcelona	18	18
Florence	3	2
Milan	18	6
Stirling	20	15
Total	79	61



Knowledge about second-hand smoke



- We asked seven Likert scale questions about knowledge of the harm of second-hand smoke and intention to avoid it
- No significant differences between centres
- Overall knowledge did not significantly affect likelihood to make change
- *“Inhaling other people’s tobacco smoke poses a high risk to health”*
- *“I would challenge someone smoking in a non-smoking area”*
- *“The dangers of inhaling other people’s tobacco smoke are greatly exaggerated”*
- *“I would ask someone who smokes to smoke outside of my house”*
- *“Children are more at risk from other people’s tobacco smoke than adults”*
- *“Exposure to other people’s tobacco smoke can increase the severity of asthma in children”*
- *“Other people’s tobacco smoke can cause significant problems for children”*

