

## Supplementary Information

### Comparison to WHO Air Quality Guidelines

**Table S1.** WHO CO guidelines compared against mean 15-min max and estimated 8-hr TWA from *chuj* users. Numbers in parentheses represent one standard deviation.

		15min max		8hr TWA	
		N	(ppm)	N	(ppm)
<b>WHO Guideline</b>		<b>87*</b>		<b>9*</b>	
<b>All Participants</b>		45	870 (600)	65	42 (33)
<b>Adults (≥ 15yrs)</b>	Adult All	32	967 (633)	36	50 (36)
	Adult Female	21	1040 (650)	22	57 (37)
	Adult Male	11	828 (604)	14	39 (31)
<b>Children</b>	Child All	13	847 (646)	29	31 (27)
	Child Female	6	859 (629)	12	30 (32)
	Child Male	7	832 (726)	17	32 (24)
	0-4yrs	0	----	5	30 (13)
	5-9yrs	5	710 (233)	11	29 (14)
	10-14yrs	8	932 (814)	12	35 (39)

\*Converted from mg/m<sup>3</sup> using 25C and 1 atm

### Chuj CO levels and COHb relative to endogenous and other exogenous sources of CO

**Table S2.** Sources of CO, reported air concentrations (ppm) and biological burden (%COHb)

Source	Average Air Concentration (ppm)	Reported %COHb
Endogenous Production	----	<1
Urban Outdoor (Ernst and Zibrak, 1998)	< 10	1-3
Cooking with solid fuels indoors (~30min) (Balakrishnan, Sakskena, 2009)	2-100	2-17
Smoking a cigarette (activley) (Raub, Mathieu-Nolf, 2000)	400-500	3-8
<b>Chuj (~35 min) (This study)(Thompson, 2008)</b>	<b>600-800</b>	<b>14 ±9</b>
Riding in the back of a pickup truck (Hampson and Norkool, 1992)*	----	18.2 ±2.4
Automobile exhaust (at tailpipe) (Widdop, 2002)	up to 10,000	----
Propane powered forklift exhaust (at tailpipe) (Ely et al. , 1995)	~36,000	----

\* Reported from poisonings in children  
 ± 1 standard deviation

### Field challenges associated with non-invasive burden methods

Key challenges that arose during sampling with each non-invasive method are outlined in Table 5.

<b>CO- oximeter (Masimo Rad -57)</b>	<b>Exhaled Breath (MicroDirect MicroCO)</b>	<b>Model For Predicting Burden Based on Environmental CO</b>
Sensor placement to maximize signal strength can be time consuming and tedious	Inability to hold breath or exhale completely during testing, even within adults	Participants forgetting to fill out time diaries of <i>chuj</i> use.
Low signal strength when blood flow is low in finger (cold) and when finger nails are thick or stained	Pushing on the mouthpiece during testing can cause artificially high concentration values (instrument model specific)	
Manual parsing of time stamped data requires very accurate time record by field staff		
Underestimation based on comparison with exhaled breath on occasion (figure 3a)		