

Supplementary Material I. Disposal practice of unused medication among people as reported by peer-reviewed literature (^A respondents could select more than one answer).

| Author (s) | Year | Locality | Sample (n) | Method of Disposal | | | | Environmental |
|---------------------------|------|---------------|------------------|--------------------|----------------------------------|--------------------|----------------------------------------------------|---------------|
| | | | | Garbage | Toilet or sink | Return to pharmacy | Other (stated) | Eco-friendly |
| Ridout et al. [21] | 1986 | England | 443 | 14.0% | 46.0% | 17.0% | 15.0% (kept medicines) 7.0% (give to others) | 39.0% |
| Blom et al. [18] | 1996 | Netherlands | 2154 | 9.0% | 3.0% | 58.0% | 16% (chemical waste) 6% (kept medicines) | 80.0% |
| Kuspis and Krenzelok [53] | 1996 | United States | 500 | 54.0% | 35.4% | 1.4% | 7.2% (kept medicines) 2% (finished medications) | 10.6% |
| Sullivan and George [22] | 1996 | England | 400 | 15.0% | 27.0% | 34.0% | 15% (kept medicines) | 49.0% |
| Bound and Voulvoulis [23] | 2005 | England | 392 | 63.2% | 11.5% | 21.8% | 3.5% (waste sites or another disposal facility) | 25.3% |
| Abahussain et al. [48] | 2006 | Kuwait | 300 ^A | 76.5% | 11.2% | 11.9% | 8.5% (give to friend) | 20.4% |
| Seehusen and Edwards [59] | 2006 | United States | 301 ^A | - | 53.80% (toilet) 35.20% (sink) | 22.9% | 14% (returned to healthcare provider) | 36.9% |

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| Abahussain et al. [49] | 2007 | Kuwait | 200 | 97.0% | 2.00% | - | 0.5% (give to friend) | <1.0% |
| Gotz and Keil [16] | 2007 | Germany (solid medication) | 1306 | 7% always 9% usually 14% sometimes 13% rarely | 1% always 2% usually 7% sometimes 6% rarely | 29% always 11% usually 15% sometimes 11% rarely | 23% recycled alongside cardboard and plastics 15% toxic waste bins | 67.0% |
| | | Germany (liquid medication) | | 10% always 8% usually 13% sometimes 12% rarely | | | - | |
| A. Ahmed et al. [32] | 2007 | Pakistan | 1022 | 82.8% | 11.5% | 1.9% | 3.8% (do not know) | 1.9% |

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| Krupiene and Dvarioniene [25] | 2007 | Lithuania (towns) | 200 | 88.0% | 7.0% | 3.0% | 2% (burning) | 3.0% |
| | | Lithuania (suburbs) | | 87.0% | 6.0% | - | 12.5% (burning) | 0.0% |
| | | Lithuania (countryside) | | 50.0% | - | - | 50% (burning) | 0.0% |
| Braund et al. [20] | 2009 | New Zealand (liquid) | 452 | 24.0% | 55.0% | 17.0% | 0.7% (give away or burn) | 17.0% |
| | | New Zealand (tablets and capsules) | | 51.0% | 19.0% | 24.0% | 2.4% (give away or burn) | 24.0% |
| | | New Zealand (ointments and creams) | | 80.0% | <1% | 13.0% | 2.4% (give away or burn) | 13.0% |

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| Kotchen et al. [54] | 2009 | United States | 1005 | 45.0% | 28.0% | 6.0% | 5% (hazardous waste center) 12% (store at home) 4% (unspecified method) | 23.0% |
| Persson et al. [17] | 2009 | Sweden | 1000 | 3.0% | - | 43.0% | 55% (kept medicines) | 97.0% |
| Abdo-Rabbo et al. [61] | 2009 | Oman | 6675 | 45.0% | - | 12.0% | 41% (keep for future use) | 53.0% |
| Kheir et al. [50] | 2011 | Qatar | 49 | 77.0% | 6.0% | - | 16% (kept medicines) | 16.0% |
| M. El-hamamsy et al. [43] | 2011 | Egypt | 316 | 26.3% | 11.4% | 12.0% | 15.5% (Use them before expiration) 11.4% (Don't dispose) | 39.5% |
| Auta et al. [45] | 2012 | Nigeria | 240 | 72.7% | 12.9% (toilet) 4.5% (sink) | - | 9.9% (burn) | 0.0% |

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| Sasu et al. [47] | 2012 | Ghana | 83 | >80% | <5% | <5% | >10% (burn) | <5.0% |
| M. Kusturica et al. [26] | 2012 | Serbia (Urban) | 208 | 85.6% | 8.7% | 4.8% | 1% (burn or give to a friend) | 4.8% |
| | | Serbia (Rural) | | 74.5% | 6.4% | 4.3% | 14.9% (burn or give to a friend) | 4.3% |
| Iabu et al. [34] | 2013 | Bangladesh (liquid) | 290 | 17.2% | 58.2% | 1.0% | 22.7% (give away or no answer) | 24.6% |
| | | Bangladesh (solid) | | 72.8% | 5.1% | 3.0% | 17.2% (give away or no answer) | 22.1% |
| | | Bangladesh (semisolid) | | 33.1% | 16.2% | 11.0% | 37.9% (give away or no answer) | 50.7% |

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| C. Fenech et al. [27] | 2013 | Malta and Ireland (liquid) | 1130 | 57.0% | 28.0% | <10% | - | <10% |
| | | Malta and Ireland (pills) | | 68.0% | 14.0% | - | - | 0.0% |
| S. Aditya and H. Singh [35] | 2013 | India (solid) | 244 | 92.0% | 2.0% | - | - | 0.0% |
| | | India (semisolid) | | 94.0% | - | - | - | 0.0% |
| | | India (liquid) | | 74.0% | 21.0% | - | - | 0.0% |
| S. Wiczorkiewicz et al. [55] | 2013 | United States | 445 | 59.0% | 30.0% | 11.0% | - | 11.0% |
| O. Fatokun [37] | 2014 | Malaysia | 250 | 78.8% | 2.0% | 6.4% | 12.8% (fridge, give to a friend, leftover) | 19.2% |

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| T. Atinafu <i>et al</i> [62] | 2014 | Ethiopia | 384 | 11.7% | 14.8% | 14.3% | 25.3% (burn) 11.2% (bury) 2.1% (donate) 20.6% (others) | 16.4% |
| A. Vellinga <i>et al.</i> [28] | 2014 | Ireland | 398 | 51.0% | 43.0% | - | 6.0% | 0.0% |
| Q. Abdallah <i>et al.</i> [51] | 2014 | Saudi Arabia (liquid) | 1386 | 71.7% | 20.0% | 5.0% | 2.8% | 5.0% |
| | | Saudi Arabia (solid) | | 63.4% | 31.9% | 1.7% | 1.9% | 1.7% |
| Arkaravichien <i>et al.</i> [40] | 2014 | Thailand (liquid) | 311 | 64.6% | 7.4% | 0.0% | 22.0% (never discarded) | 22.0% |
| | | Thailand (solid) | | 81.4% | 0.0% | 1.0% | 1.6% (land filled) 32.8% (never discarded) | 33.8% |
| | | Thailand (semisolid) | | 66.6% | 0.0% | 0.0% | 0.6% (land filled) | 0% |

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| A. Law et al. [56] | 2014 | United States (web) | 238 ^A | 62.7% | 18.0% | 11.3% | 17.4% (store) | 28.7% |
| | | United States (paper) | 68 | - | 4.3% | 1.8% | 8% (unspecified) | 1.8% |
| S. Banwat et al. [46] | 2016 | Nigeria | 105 | 70.5% | 19.0% | - | 10.5% (burn) | 0.0% |
| D. Tit et al. [29] | 2016 | Romania | 771 | 95.3% | - | 0.7% | 4% (other places) | 0.7% |
| M. Kozak et al. [36] | 2016 | India | 200 | 37.5% | 22.0% | - | 40.5% (store home) | 40.5% |
| M. Bashaar et al. [33] | 2017 | Pakistan | 301 | 77.7% | 12.0% | 7.3% | 1.3% (donate) | 8.4% |
| E. Bettington [19] | 2017 | Australia | 2521 ^A | 64.4% | 23.0% | 23.0% | 3% (burn) | 23.0% |
| A. Zorpas et al. [30] | 2017 | Cyprus | 184 ^A | 92.4% | 24.5% | - | 0.5% (burn) | 0.0% |
| K. Addin et al. [63] | 2018 | Sudan | 320 | 23.1% | 3.3% | - | 48.9% (Burn) | 0.0% |

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| A. Yang et al. [38] | 2018 | Malaysia | 148 | 47.8% | 7.5% | 30.0% | 5.1% (keep) 4.7% (donate) 1.6% (burn) 3.2% (others) | 39.8% |
| A. Akici et al. [24] | 2018 | Turkey | 1121 | 33.9% | | 34.0% | 32.1% (bring to drug-box of the company) | 66.1% |
| Y. Ayele et al. [44] | 2018 | Ethiopia | 694 | 53.2% | 37.2% | 2.2% | 0.4% (donate) 7.0% (others) | 2.6% |
| Barnett et al. [52] | 2019 | Israel | 602 | 80.0% | 4.0% | 6.0% | - | 6.0% |
| G. Viana et al. [57] | 2019 | Brazil | 182 | 48.4% | 14.2% | 23.1% | 8.2% (keep) 2.2% (landfill) 3.8% (others) | 31.3% |
| S. Chung et al. [41] | 2019 | Hong Kong, China | 1865 | 53.9% | 5.4% | 0.9% | 0.5% (burn) 0.5% (donate) 0.6% (sell) 35.3% (use) | 37.3% |

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| G. Quadra et al. [58] | 2019 | Brazil | 540 | 66.0% | 7.0% | 24.0% | 2.0% (share) 1.0% (burn) | 26.0% |
| K. Albaroodi [60] | 2019 | Iraq (semisolid) | 129 | 41.9% | 2.3% | 33.3% | 21.7% (burn) 0.8% (other) | 33.3% |
| | | Iraq (liquid) | | 16.3% | 60.5% | 19.4% | 2.3% (burn) 1.6% (other) | 19.4% |
| J. Rogowska [31] | 2019 | Poland (survey I) | 450 | 68.0% | | 30.0% | - | 30.0% |
| | | Poland (survey II) | 635 | 35.0% | | 35.7% | 29.3% (other) | 35.7% |
| Ariffin et al. [39] | 2019 | Malaysia | 103 ^A | 63.1% | 14.6% | 25.2% | - | 25.2% |
| X. Yu et al. [42] | 2019 | China (Young-adult) | 365 | 75.0% | 15.0% | 1.0% | 9.0% (burn) | 1.0% |
| | | China (elderly) | 206 | 69.0% | 9.0% | 2.0% | 20.0% (burn) | 2.0% |



Supplementary Material II

Questionnaire

Dear participant,

Thank you for your participation. This questionnaire is designed to gather information for a research project about common practices related to the disposal of expired prescription drugs. Please answer the following questions freely and to the best of your knowledge. The questionnaire is anonymous and individual data will be kept strictly confidential. Further information: s8alfaez@stud.uni-saarland.de

1. Age

- 18-24 25-34 35-44 45-55 Over 55
-

2. Gender

- Male Female Other / Unspecified
-

3. Level of education

- High school College (Abitur) University degree Unspecified
-

4. How often do you use prescription drugs?

- Every day A few times a week Occasionally when needed Never
-

5. What do you do with surplus unexpired prescription drugs?

- Dispose them Donate /share them Keep them until they expire Other
-

6. Please estimate which percentage of your own prescription medicines expire before you use them.

- None less than 25% less than 50% more than 50% more than 75%
-

7. How do you dispose expired prescription drugs?

- Down the toilet Down the sink Garbage Compost Burn
 In public (river, bin, forest) Return to pharmacy Use a drug-take-back system
 Continue to use medication even if it is expired No answer Other _____
-

8. Are you familiar with the concept of drug-take-back systems?

- No Heard of it Use it myself Would use it if available
-

9. In your personal opinion, how should expired prescription drugs be handled? (You can add any relevant comments here, cont. on the back)
