Since 1997, Intel has used silicide fuse technology to trace microprocessor units from wafer probe through packaged test operations. This has allowed us to examine the correlation between wafer probe and post burn-in data on individual packaged units. It is now simple to examine sample sizes of over 10 million units. From these data, the author draws several key findings:

1. At every level of sampling, probe yield is a good predictor of post burn-in yield. Poor yielding lots or wafers produce packaged units with an elevated failure rate. Additionally, poor yielding regions of the wafer, or die positions that consistently fail in a particular lot, give packaged units with higher failure rates.

2. Almost any reasonable hypothesis one can draw from probe data will be confirmed with post burn-in data. For example, if a group of lots shows poor probe yield at the edge of the wafer, it is likely that the remaining edge die will show high post burn-in fallout. Traceability data have allowed us to confirm many reasonable beliefs and practices that were heretofore based on engineering judgment.

3. Decisions to scrap die that pass all tests at wafer probe, but whose reliability is suspect due to low yield, are best made at the die level rather than at the wafer level. Indeed, using the probe data from surrounding die, one can predict levels of post burn-in fallout fairly accurately.

4. It is difficult to dramatically improve overall reliability by selectively eliminating good die from low yielding areas at wafer probe. Although it is not difficult to isolate a portion of the population with greatly increased risk of post burn-in fallout, these die account for a small overall portion of total failures.

5. Additional options are available beyond merely scrapping or failing to scrap a die at wafer probe. It may still be useful to distinguish the predicted post burn-in fallout of different units. For example, one could subject units from low-yielding populations to longer burn-in times, or completely eliminate burn-in for high yielding units.

6. Many ideas for reliability improvement are predicated on the ability to segregate die into different populations prior to assembly. This often proves to be the biggest challenge in reliability improvement efforts.

The author recommends a multi-staged approach to dealing with good die in bad neighborhoods. Die that clearly pose high reliability risk based on extremely low yield should be eliminated at the die level at wafer probe. Other die should be graded based on predicted reliability and handled accordingly. Depending on overall yield, die size, and reliability requirements, some possibilities include elimination of burn-in on high yielding units, longer burn-in for poor yielding units, or diversion of units into package types and applications suited to their predicted reliability. This approach is not a replacement for comprehensive testing, but it is a useful supplement. There is no additional test cost, as it uses existing information, and the main drawback is the need for material segregation prior to assembly.